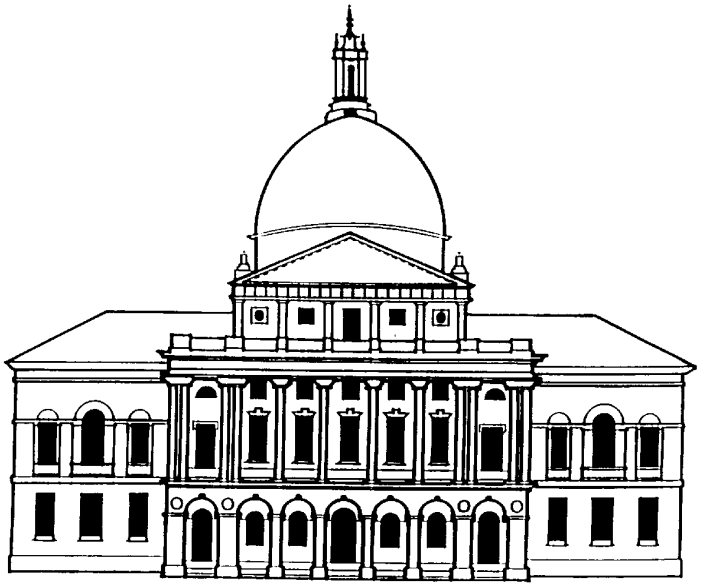
THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE FOR

ADMINISTRATION AND FINANCE



INSTRUCTIONS FOR DESIGNERS

DIVISION OF CAPITAL ASSET MANAGEMENT

JOHN W. McCORMACK BUILDING

ONE ASHBURTON PLACE

BOSTON, MA 02108

FORM 9

NOVEMBER 15, 1999

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PAGE ISSUED

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INTRODUCTION

The initial instructions were first issued around 1950, and have been updated periodically until the last major change in 1988. Since 1988, minor changes have been made. This version allows the insertion of complete sections as required to update this manual. It is anticipated that this ease of revision will allow frequent up-dates.

As the State agency responsible for major public building construction, the Division of Capital Asset Management (DCAM) strives to provide Designers with the tools and information necessary to efficiently and effectively deliver high quality design services to DCAM. The purpose of the Instructions for Designers is to assist Designers in delivering to DCAM professional services which result in high performance buildings that are cost-effective and constructed in a timely manner. The Instructions for Designers reflects DCAM's overall goal of minimizing public expense and maximizing public benefits. In general two sections of Massachusetts General Law apply to public construction, Chapter 149, for building construction and Chapter 30, for site and utility work.

The Instructions for Designers supplements and is incorporated by reference into the Designer contract which is executed between the Designer and DCAM. All sections of the Designer contract are applicable to each project regardless of whether the Instructions to Designers references those sections of the Designer contract. If a conflict exists in the service required of the Designer in the Designer's contract and Form 9, the more demanding requirement shall govern. Any Designer that has signed a Designer contract with DCAM is required to meet requirements outlined herein. Designers that are working on DCAM projects, but who have not entered directly into design contracts with DCAM (e.g. Design-Build project team members), are not required to conform with the administrative project requirements outlined in the Instructions. However, the Specification Format section, including Design Standards and Requirements, will apply to all design work undertaken for DCAM.

The Instructions for Designers has been updated to reflect developments and current standards in the building design and construction industry. Such developments include the use of electronic information systems, refinement of environmental compliance requirements, and the maturing of the concept of sustainable design. Designers are advised that technical revisions to the Instructions will be issued as conditions warrant.

This version of "Instructions to Designers" supercedes all previous editions and will be effective November 15, 1999.

Definitions:

Alternate:	A discreet area of work which may be added to the contract, if funds are available. Alternates must be accepted in sequential order.
Building cost:	The total cost of the building, including all fixed equipment.
CAD Layer Guidelines:	A standard for Computer Aided Design layer and file nomenclature developed by the American Institute of Architects (Latest Edition).
Commissioner:	The Commissioner of the Division of Capital Asset Management.
Designer:	The person or firm performing professional services under this contract.
Design Contingency:	A percentage of the Fixed Limit of Construction Cost retained by the Designer during the development of the plans for unknown, design related items. This contingency should be incorporated into the FLCC prior to bidding.
Director:	The Director of the Office of Construction Services, or the Deputy Commissioner.
ECC:	Estimated Construction Cost, the cost of the building, site work and fixed equipment, excluding escalation and design contingency.
Escalation:	The amount of estimated increase in the bid price from the time the estimate is prepared. This percentage is normally calculated to the mid-point of construction.
Filed Sub-contractor:	Areas of work required by MGL, if over $10,000 in value which must be bid separately, as filed sub-bids. They are listed on pages A-1and A-2 under the specifications section.
Filed Sub Sub-contractor:	Areas of specialized work of the filed sub-contractor which DCAM determines to be bid as filed sub sub-contracts. Examples are, temperature controls, duct work, balancing and mechanical insulation.
FLCC:	The Fixed Limit of Construction Cost, the maximum cost of construction established by DCAM as set forth in the A-5letter and any amendments.
Furnishings:	Any moveable equipment not secured to either the wall or floor, without permanent utility connections, including tables, chairs, couches, computer equipment, etc.
General Conditions of the Contract:	The General Conditions of the Contract are a description of general requirements for all DCAM construction projects provided by DCAM.

General Contractor:	The company or corporation providing the lowest responsible bid price, approved by DCAM to construct the project. Also referenced as the Contractor.
Gross Area:	The area included within the outside faces of the exterior walls for all stories. Custodial areas such as janitor closets, building maintenance and building employees' locker rooms, circulation areas such as corridors, lobbies, stairs and elevators, and mechanical areas such as those designated to house mechanical and electrical equipment, utility services, and non-private toilets shall be considered as part of the gross area, but not part of the net area..
House Doctors:	Designers chosen by the Designer Selection Board to study, review or prepare plans for various renovation projects which do not exceed a maximum combined study and design fee of $100,000.
LCC:	Life Cycle Cost, an economic analysis of a product or piece of equipment to determine the total cost for purchase, fuel, and salvage value, for its estimated life.
Net Area:	In general, those areas which have a specific assignment and functional use as determined by the type of facility, including, but not limited to, special use areas such as cafeterias, auditoriums, bed patient rooms and classrooms. These shall be measured from the inside finish of permanent outside walls to the inside finish of corridor walls, and to the center line of intermediate partitions.
Quality Control Drawings:	Drawings prepared by the Designer to coordinate it's work and the work of it's consultants to maintain quality control.
Requirements:	Items which should be included in a specific section of the specifications. If these items are included then certain standards apply.
Standards:	When a specific requirement is included in the specifications he following standard of quality should be included in the specifications.
Sub-contractor:	Any company or individual under contract to the general contractor to perform a specific area of work, not a filed sub-contractor.
Supplemental General Conditions:	Additional general requirements, which are provided by the Designer, which are specific to the project. Examples are: construction phasing, security, hours of work, etc.

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I. PROCEDURES

A. GENERAL

1. Administrative Requirements

a) These procedures shall be strictly adhered to during the development and management of the project.

b) The Designer shall utilize the Schedule of Procedures included herein throughout the project. (**Refer to Schedule of Procedures Appendix A**.)

c) All correspondence shall be addressed to the Deputy Commissioner for Construction Services with attention to the Project Manager. Include the Project Number, Contract Number and the Project Title. A letter of transmittal shall accompany the submission of all documents with the step number referenced in the upper right corner. (**Refer to Schedule of Procedures Appendix A**.)

d) The Designer shall prepare meeting minutes of all design and construction phase meetings when in attendance with any person or group relative to the project. A draft copy shall be faxed to the Project Manager within two days of the meeting. Upon approval, two copies of the memorandum shall be delivered to Division of Capital Asset Management (DCAM) and a copy shall be sent (E-mail or facsimile is acceptable) to all in attendance. All memoranda or meeting notes shall have a statement that all information presented is considered accurate unless written notice of modification is received within five days. The Designer shall reissue the meeting notes or memoranda with the corrections highlighted in bold. All meetings shall have action items listed with the responsibility assigned to the appropriate party. (**Refer to format attached, Appendix B**).

e) All drawings and specifications shall be thoroughly checked and coordinated to the point where detailed checking by the Division of Capital Asset Management will not be necessary. To assist in the coordination effort, Quality Control Drawings shall be prepared by the Designer. If it becomes apparent that the drawings and specifications were not thoroughly checked, they will be returned to the Designer for corrections at no additional cost to the Commonwealth.

f) DCAM reserves the right to reject all drawings, specifications, laboratory testing and work of Licensed Site Professionals (LSP) due to errors, omissions, and inaccuracies based on preliminary and cursory examination, a detailed list of omissions is not required. Care should be taken to prepare complete and accurate submissions, rejection of drawings and specifications may affect the Designers ability to work with DCAM in the future.

g) The Designer shall thoroughly review and coordinate the work of its consultants to insure that there will be no conflicts, redundancies, or omissions in the work of the General Contractor., filed subcontractors, and non-filed subcontractors.

h) Catalogs sheets, brochures, diagrams, schedules, performance charts, illustrations of materials, assemblies and systems specified, and MSDS sheets (where applicable) and other standard descriptive data be assembled in a loose-leaf binder by specification section and submitted at the B-4 phase and updated when a change occurs. Physical material samples of specified materials shall be furnished to DCAM upon request.

i) The Designer shall issue to the Division of Capital Asset Management, a set of Construction Documents signed or stamped approved by the Department of Public Safety (or the local Building Inspector if a County owned facility) on the Title Sheet or initial Architectural sheet. The Designer shall also include with its submittal to DPS a Code Compliance Plan & Code Analysis Sheet which contains all floor plans at a reduced scale showing rated walls and accompanied by text indicating the "type" of construction classification, "Use Group", and occupancy loads for the project as defined by the State Building Code. (Refer to **Appendix C**)

j) The Designer shall not proceed into the next phase of design beyond that phase being evaluated and reviewed, until written approval has been issued by the Deputy Commissioner of Construction Services, Division of Capital Asset Management, with instructions to proceed with the next phase.

k) The Designer shall not communicate with any regulatory body without the prior authorization of the DCAM.

2. Design Requirements

a) The design of all projects shall be functional, practical and cost efficient. Projects not meeting these requirements shall be redesigned as necessary at no increase in fee at the direction of the Deputy Commissioner for Construction Services.

b) All projects involving buildings or structures to be renovated, constructed or demolished shall be designed in accordance with the latest edition of the Commonwealth of Massachusetts State Building Code and Energy Conservation Building Code.

c) The project shall be designed within the Fixed Limit Construction Cost as approved by the Division of Capital Asset Management.

d) Projects shall be designed to minimize harmful environmental and human health impacts and maximize resource-efficient design, materials, methods and operation. Sustainable design aspects to be considered in completing projects include:

1. Maximizing efficient use of energy and water including the building envelope and selection of building systems.
2. Maximizing indoor environmental quality by specifying materials whose emissions of particles and vapors (including volatile organic compounds) are as low as technically feasible.

3. Using recycled-content and non-toxic building materials.
4. Minimizing the impact on the local environment and site.
5. Consistent with DEP policy, contaminated material shall be detoxified, recycled or reused if at all possible. Disposal of said material in a landfill shall be the option of last resort.

e) The Designer shall be responsible for all aspects of the project design. The Designer shall have reviewed the study and have an understanding of the functions of existing or proposed facilities.

f) The Designer shall prepare the Life Cycle Cost (LCC) for alternative fuel systems and other building components that can have a bearing on energy use and resource efficiency, including but not limited to: building envelope, HVAC systems, heat recovery systems, variable speed drives, variable air volume systems, lighting, controls and sustainable building materials. (**Refer to Appendix N, Section 5**)

g) The Designer shall submit alternate design schemes and shall compare each with respect to initial cost, operating cost, design, and programmatic solution. Alternate system designs, including structural, mechanical, and electrical systems with comparative cost analyses are required. In a written narrative, clearly demonstrate that the recommended scheme is the preferred solution. DCAM reserves the right to require additional schemes if the Designer has not demonstrated that it's recommended solution addresses the needs of the User agency or DCAM.

h) It has been established, through court precedents, that the Commonwealth is not bound by local ordinances. It is, however, the desire of the Division of Capital Asset Management to comply with local zoning and ordinances to the extent that such restrictions are consistent with the Commonwealth's purposes. **The Designer shall not communicate with any local agency or official without the prior authorization of the DCAM.**

i) The Designer shall conform to Chapter 30, Section 39M, of the General Laws which, in part, states, "For each item of material the Specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said names or described materials."

j) The Designer shall include consideration of designs developed in conjunction with energy conservation design programs offered by electric and gas utilities. The designer shall work with Division of Capital Asset Management to qualify for and apply for all rebates available from the utility companies for which the Commonwealth is eligible. (**Refer to Appendix N)**

The Designer shall include consideration of potential environmental concerns that may impact the design. The Designer shall coordinate with DCAM to ensure compliance with applicable state and federal regulations and laws, and cost effective design and implementation of investigative and remedial programs. (**Refer to Appendix O)**

3. Drawing Requirements

a) The outside dimensions of drawings, including Schematic, Design Development, and Construction Drawings, shall be 30 inches by 42 inches. Within these dimensions, there shall be a 1/2 inch border at top, bottom, and right side, and a 1 1/2 inch border at left side (**Refer to Appendix E.**).

b) The title box of each drawing shall conform to the sample (**Refer to Appendix G**) and shall include the Designer's or Consultant's registration seal and signature, A facsimile signature stamp will not be accepted. Professional Engineers shall stamp only those drawings in the discipline that they are registered. For the C-10 submittal, the C-9 Approval date shall be used in the title box of all Construction Drawings and in the upper right hand corner of all specification sections.

c) If there are five or more drawings in a set, the top sheet shall be a title sheet containing a complete index with drawing numbers and title of each drawing (**Refer to Appendix F).** If there are less, the top sheet shall contain the index adjacent to the right border above the title box.

   (1) Title sheet lettering shall be simple line or block lettering arranged in accordance with the sample.

   (2) The name of the Designer and each of the Consultants shall appear on the title sheet. The registration seal and signature shall appear directly below each name. A facsimile signature stamp will not be accepted. Professional Engineers shall stamp only in the discipline in which they are registered in the Commonwealth of Massachusetts. **(Refer to Appendix F)**

d) Drawings shall be clear and legible.

e) Scale of floor plans shall be ¼”= 1’-0”. The Division of Capital Asset Management must approve any change in this requirement.

f) The system of numbering and sequence of drawings for projects shall be submitted to DCAM for approval. Refer to the AIA CAD Layer Guidelines for an example of an acceptable system.

g) Drawings submitted to the Division of Capital Asset Management shall be black line prints on white.

h) Reproducible drawings shall be black line on mylar (4 mil).

i) An arrow indicating North shall be shown on all site & utility plans and all floor plans (demolition, architectural, structural, plumbing, HVAC, fire protection, and electrical).

j) All floor plans that are too large for a single sheet shall include a match-line and a small scale key plan on each sheet.

k) Pressed lettering or applied films shall not be used.

l) An electronic version of each submission shall be transmitted to DCAM at each phase of the project. This electronic version should be compatible with the most current version of AutoCAD and the AIA CAD Layer Guidelines (2nd Edition).

4. Specification Requirements

a) All Specifications shall be:

(1) Black print on white, clear and legible.

(2) Page size (8-1/2 inches x 11 inches) bound on left side, with protective cover, containing thereon the project number and title (**Refer to Appendix D**)

(3) Each page shall have a header with the project title, project number, and C-9 Approval Date.

(4) Sufficient margins shall be maintained to allow for binding and possible printing on both sides of each sheet.

b) Reproducibles for specifications shall be one sided originals on high quality bond paper suitable for mass reproduction, not bound.

c) Specification requirements and standards are included in the section titled Specifications of these instructions.

d) Separate filed sub-bids are required for the specification sections indicated if the estimated cost of the work for any Section exceeds $10,000.

e) At the C-10 submittal, transmit an electronic version of the specification text to DCAM, with the reproducible documents. This electronic version shall be compatible with the latest version of MS Word.

5. Estimating Requirements

a) Reliable cost estimates shall be prepared by a competent Estimator as required by the Designer's Contract, if different from the DSB application, and the Estimator's qualifications shall be submitted to the Division of Capital Asset Management for approval at the B-conference. **Estimators not affiliated with the Designer are preferred**. The Division of Capital Asset Management can make an exception to this requirement if the project is of limited scope.

b) Estimates shall bear the name of the Estimator and the date that the submission was made. Note that the Fixed Limit Construction Cost indicated in the A-5 Authorization Letter is established for the date of receipt of General Bids. The Estimator shall indicate the current value date on the estimate summary sheet.

c) During the Schematic and Design Development phase, cost estimates shall be in as complete detail as the drawings and specifications permit, with totals for each section of the Specifications. Lump sums or square footage allowances should be limited.

d) During the Construction Documents Phase, the cost estimate shall be in complete detail with totals for each section of the Specifications.

e) A computation of the square footage as well as unit costs of all building projects shall be a part of the cost estimate accompanying all submittals. For definitions of net and gross areas, refer to Construction Documents, Phase 3 (page I-E-1).

f) The Designer shall include the estimated number of calendar days required for construction of the project with the cost estimate at each submission. The estimate shall include escalation to the mid-point of construction.

6. Surveys, Subsoil Explorations and Testing

a) General

(1) The Division of Capital Asset Management will furnish to the Designer applicable studies, programs, surveys, photographs and subsoil exploration reports of the project's building site, or sites, if available, including any additional information as to water, sewer, electricity, steam, gas, telephone and other services.

(2) If, in the opinion of the Designer, sufficient information is not available, the Designer shall request authorization to either obtain the services of a consultant or to perform the necessary exploratory work with its own employees. This request shall be at the appropriate point in the design process. The purpose of this work is to establish accurate existing conditions and minimize change orders in construction.

(3) If a Consultant's services are required, and it is not a member of the Designer's team, a detailed description of the proposed services shall be prepared by the Designer and submitted for approval to the Project Manager. The Designer is then responsible for obtaining several proposals for the work required, after which s/he shall submit a letter requesting a reservation of funds with the description of services, the total not-to-exceed amount requested with its fee if applicable, and its recommendation on the proposals to the Deputy Commissioner for approval before any work is authorized.

(4) When preparing a description of the work to be performed, the Designer shall comply with the provisions of Chapter 149 Sections 26 and 27 of the General Laws by including the prevailing wage rates when required. Consultants shall also be instructed to have adequate public liability and property damage liability insurance along with worker's compensation insurance.

(5) The Designer shall be responsible for coordinating the work prepared by its authorized consultants and shall review, analyze and evaluate the results.

(6) The cost of such surveys and subsoil explorations which may include taking of borings soil sampling, and laboratory tests shall be in accordance with the Designer's contract. The preparation of drawings and/or specifications that are required to obtain prices of surveys or subsoil information, and any other soils engineering shall be prepared by the Designer within the basic fee

b) Land Surveys

(1) All land surveys shall be performed by Registered Land Surveyors or Registered Civil Engineers of the Commonwealth of Massachusetts. The registration stamp shall appear with the registrant's signature on all drawings or maps submitted.

(2) Surveys shall conform with the "Professional Practice of Surveying and Mapping within Civil Engineering" as adopted by the American Congress on Surveying and Mapping (ACSM).

(3) Each surveyor's proposal shall indicate a total upset price (not to exceed cost) which shall be the maximum cost to perform the work.

(4) In preparing the description of the work for a survey, the following requirements shall be included when applicable:

(a) Locate all pertinent structures and extent of paved areas.

(b) Establish permanent base lines with reference points.

(c) Establish bench marks.

(d) Locate property lines and bound corners if site is newly acquired and/or whenever feasible.

(e) Indicate topography and the survey datum source used.

(f) Locate all utilities and manhole inverts.

(g) Locate all floor, roof and parapet elevations if appropriate.

(h) Identify significant planting and trees (species, caliper, etc.)

(5) Coordinate all survey work in such a manner that control points and a main baseline can be reproduced in the field.

(6) The Surveyor shall provide the location (stake) and ground surface elevation for each boring. No change in boring locations shall be made unless prior consent of the Designer is obtained. Boring locations shall be referenced to the main survey baseline whenever feasible.

(7) The Surveyor shall provide the location, ground surface elevation, top of inner casing, and top of outer casing for each monitoring well.

(8) The Surveyor shall provide the location for each test pit.

c) Subsoil Investigations

(1) All subsoil exploration and soil testing shall be performed by qualified experienced firms.

(2) Each firm's proposal shall be in conformance with the provisions of Chapter 149 of the General Laws (solicit three bids) and shall indicate a total upset price (not to exceed cost) which shall be the maximum cost to perform the work.

(3) The Designer shall be responsible for the lawful and appropriate disposal of wastes derived during investigations.

d) Testing

(1) All testing shall be performed by qualified and experienced firms.

(2) Each firm's proposal shall be in conformance with the provisions of Chapter 149 of the General Laws and shall indicate a total upset price (not to exceed cost) which shall be the maximum cost to perform the work.

(3) Testing methods shall be scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use.

(4) Testing shall be performed in accordance with current standard policies and methods. Whenever possible, documentation of testing results shall be complete on prepared standard forms complying with the test method or policy.

e). Testing of Potentially Contaminated Materials

(1) Analytical methods shall be scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use.
(2) Procedures and methodologies employed for the analysis of potentially contaminated samples shall consist of methods published by the DEP, EPA, ASTM, AWWA, NIOSH, and other organizations with expertise in the development of standardized analytical testing methods.
(3) Analytical report packages shall include, at a minimum, the results, blank analyses, surrogate summary, spike analyses, spike duplicate analyses, duplicate analyses, LCS, Chain-of-Custody, Certificates, and Sample receipt checklist. Additional requirements may be necessary depending upon the expected use of the data.

7. Life Cycle Costing (LCC) (see also, Appendix N)

a) LCC shall be performed for designated measures, including the relationships of building systems, and their alternates to determine the full cost implications of materials and systems selected.

b) The quantitative elements of the LCC evaluation include: hours of operation, initial cost, utility company rebates, energy use, energy costs, training costs, maintenance costs, net cost/year for ten years. The evaluation will be accompanied by identification of qualitative or harder to quantify factors that also influence the decision making such as: equipment life, disposal cost/salvage value, environmental considerations (e.g., air

quality, waste, permits, certifications), and other relevant positive or negative factors that should be considered.

c) Designers of educational facilities and pools shall pay particular attention to the use of alternative fuel systems (e.g., photovoltaics, wind, cogeneration, etc.)

8. Testing of Suspect Asbestos Containing Material

a) The Designer shall inspect the project and determine if it is suspected that the project contains any of the items listed in **Appendix P**. If this determination is positive the Designer shall procure a testing agency to determine the extent of the asbestos containing material.

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B. STUDIES

1. General

(a) Studies will be undertaken in accordance with DCAM Publication Guidelines for Studies of Building Projects Prepared for State Agencies, Building Authorities and Counties. Site evaluation studies will be performed by a Study Designer.

(b) Studies serve as the basis for the Designer's work. The intent of the study is to determine a project budget, establish adjacencies, arrive at a square footage and provide the scope of work. It is not intended to determine the final design. Studies may be initiated either through DCAM's Office of Programming or through its Office of Construction Services. Regardless of the origin of the study, before a design is initiated, the study is certified by DCAM and the User Agency for whom the project is to be developed. The certification process confirms that DCAM and the User Agency agree on the program and that there is sufficient funding to implement the recommended program. It is the responsibility of the Designer to review all of the findings and recommendations contained in the certified study and determine if they are in conformance with all codes and professional practice.

If, as is permitted in certain cases, a study consultant is retained to undertake the design phase of the same project, a separate Designer Contract will be executed between the Designer and DCAM. Upon execution of the Designer Contract, the Instructions for Designers will be incorporated by reference into the terms and conditions of the Designer Contract.

2. Requirements

(a) All study reports prepared by the Study Designer shall generally include the following in accordance with the approved program:

1) One or more single line schematic floor layouts.

2) An outline of the major building construction system which is proposed for the project.

3) The source, capacities and method of obtaining all utilities.

4) Estimated mechanical and electrical loads including applicable heating, cooling, domestic hot water and electrical block loads.

5) A budget cost estimate in as much detail as possible indicating the cost of the project.

6) Any consideration of phasing of the project or unique features.

7) A designation of the appropriate measures to be examined using life cycle costing techniques.

8) Sustainable design goals and ways the project can meet those goals.

9) Elements of construction or demolition waste that would be recyclable.

C. SCHEMATICS - PHASE 1

1. General

a) In accordance with the Division of Capital Asset Management's Type 2 contract for Designer services, Article V, Phase 1 and the Notice to Proceed from the Deputy Commissioner, the Designer shall meet, as necessary, with the Project Manager and other agents of the Division of Capital Asset Management and representatives of the Agency in work-shop sessions to establish the basic design concepts.

b) The function of the Schematic Phase is to review, develop and implement the Study and/or Program parameters and further investigate the mechanical systems, code issues and site utilities. The Designer's solutions will be reviewed by the Division of Capital Asset Management and the User Agency. If acceptable DCAM and the User Agency will direct the Designer to proceed to the next phase. If this submission is not acceptable to either DCAM or the User Agency, the Designer will be required to submit sufficient alternative schematic approaches that satisfactorily address DCAM and the User Agency's concerns.

c) The submission shall contain a space utilization breakdown comparing the areas of each scheme with the program requirements as well as proposed structural, mechanical and electrical systems with comparative costs and alternatives. Preliminary Life Cycle costing for alternatives shall address:

1) the building envelope and insulation and their effect on the size of mechanical systems;
2) strategies for water and energy conservation and efficiency;
3) the use of recycled and recyclable materials; and
4) the avoidance of toxic emissions from materials.

Each alternative shall include the Designer's recommendation.

d) The Designer shall also submit a summary comparing the schematic plans, outline specification and cost estimate to the program and study requirements and explain any deviation. The Designer shall be aware of Mass. General Law, Chapter 29, Sec 26A, which prohibits payment for design work that changes the gross square footage by more than 10% of the gross square footage indicated in the certified study.

e) The schematic phase of design shall include as a minimum, all of the following criteria unless otherwise indicated. Schematic Design Submittals which do not conform to the criteria listed below under Drawing and Specification Requirements will be returned for lack of compliance and shall be resubmitted.

f) Provide a code review (**Refer to Appendix C**)

g) Provide a list of all permits and testing required. Provide a schedule for permits and testing and the responsibility for obtaining these. *[Designer's Note: a partial list may be contained in the study or the ENF, the Designer may not rely on this list as being complete.]*

2. Drawing Requirements

a) The schematic submission for new construction, renovation, or demolition projects shall include the following:

(1) Premise upon which the design scheme is based, including sketches which illustrate indoor and outdoor program functional relationships.

(2) Site plans of project addressing impact of access, zoning, utilities, environment, parking and other related program criteria.

(3) Floor plans of all levels identifying all program spaces.

(4) Demolition and existing conditions floor plans for all trades.

(5) Four elevations from main orientation points of view indicating relationship to site configurations.

(6) Two cross-sections with floor heights, including basement spaces identifying program spaces and relationship to site configurations.

(7) A three dimensional representation, axonometric or perspective drawing or three aerial photographic views of Designer's study model to convey general massing of the project.

(8) A code review as outlined. (**Refer to Appendix C**)

a) (9) A list of all permits and testing required *[Designer's Note: a partial list may be contained in the study or the ENF, the Designer may not rely on this list as being complete.]*

a) The size and scale of drawings shall be uniform as indicated. (**Refer to Appendix E)**

b) Title sheet shall contain all information as indicated. (**Refer to Appendix F**)

c) A graphic scale shall appear on all drawings.

3. Specification Requirements

a) Specifications shall consist of a general description of the project and shall include a "Basis of Design" to satisfy the needs of the program.

b) The Specifications shall be as comprehensive and complete as the Schematic Documents permit and shall address all relevant components/sections of the work and where required by the scope of the project, include equipment, capacities, and descriptions of structural, mechanical, and electrical and other special systems which impact on the project.

c) The Section numbers and titles established at the Schematic Phase shall be the same as the Section numbers and titles for the Design Development and Construction Document Phases.

4. Estimating Requirements

a) The estimate shall be developed in as much detail as the schematic drawings and specifications permit, and a cost for each Section of the Specification shall be included.

b) The estimate shall reflect the current construction cost. The total cost shall include a contingency factor, as determined by the Designer. The anticipated bid date will be determined by DCAM with the Designer's input at the "B" Conference. The Designer shall include all inflation/escalation factors.

c) Summary sheets shall be developed which shall list each section of the work as well as the following:

(1) The date that the estimate was prepared.

(2) The anticipated bid date.

(3) Site Cost (including all utilities).

(4) Building Cost (including fixed equipment).

(5) Estimated construction cost of each section of the work, with a total.

(6) Square Footage of Building (gross). Refer to the Definitions.

(7) Indicate Approximate Ratio of Net to Gross Square Footage,

(8) Square Foot Cost of Building (gross). Refer to Definitions.

(9) Unit User Cost (student, bed, inmate, etc),

(10) The number of **calendar days** to complete the project.

(11) The ratio of the Building gross area to the certified study gross area.

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D. DESIGN DEVELOPMENT - PHASE 2

1. General Requirements

a) Drawings shall conform to all requirements of the Department of Public Safety and state agencies having jurisdiction.

b) For state projects, the Designer shall offer the Design Development drawings to the Department of Public Safety inspector in whose jurisdiction the project is to be located for a "Tentative Approval" review. For county -owned buildings, the Designer shall offer the Design Development drawings to the Building Commissioner of the city or town that the project is to be located for a "Tentative Approval" review.

c) Provide the results of all testing performed.

d) Provide a list of all permits required, including all environmental permits.

e) Provide a LCC analysis.

f) The Designer shall submit a summary comparing the design development drawings and specifications, and cost estimate to the program and study requirements, and explain any deviations.

2. Drawing Requirements

a) Design Development Drawings for new construction or renovation projects shall generally include a presentation of not less than the following, unless otherwise permitted by DCAM:

(1) Site and Utility Drawings

(a) Plot plan indicating existing and proposed contours and locations of the proposed building or buildings -including bench marks.

(b) All utilities existing and proposed, indicating location, elevation, inverts, composition and size.

(c) Roads, parking areas and other site improvements.

(d) Building locations referenced from main survey baseline.

(e) Edge of wet lands, 100 foot buffer zone, riparian zone, if present.

(f) Site profile sections based on a 10’-0” grid (unless otherwise approved by DCAM), showing surface and anticipated sub-surface conditions of the project site within proposed limits of construction.

(2) Existing Conditions and Demolition drawings

(3) Architectural Drawings

(a) Floor plan layouts for all floors in sufficient detail and dimensions.

(b) Building elevations with indications of building materials.

(c) Cross-sections of the building at appropriate points to show ceiling heights, floor and wall construction and flashing details.

(d) Finish schedules.

(4) Structural Drawings

(a) Locations and dates of test boring holes, test pits and results of soil investigation including water levels, allowable soil bearing pressure and bottom grades of footings and slabs.

(b) Alternate structural designs with comparative cost estimates as required.

(c) Structural drawings indicating type and character of structural systems, including sizes of typical members.

(5) Fire Protection Drawings

(a) Floor plans indicating wet or dry type systems, hose racks or cabinets and fire department tie-ins. For tile ceilings, sprinkler heads shall be located on centerline of tiles.

(b) Fire Protection Systems over $10,000 shall be included as a filed sub-bid.

(6) Plumbing Drawings

(a) Floor plans indicating locations of all plumbing fixtures and special features, and approximate size of all piping systems, principal items of equipment and typical riser diagrams.

(7) Heating, Ventilating and Air Conditioning Drawings

(a) The heating and cooling systems indicating in sufficient detail the source of heat and cooling and method and location of heating and cooling distribution and controls within the building,

(b) Show locations and approximate sizes of piping systems, air handling systems and principal items of equipment such as compressors or cooling towers. Also include necessary controls and riser diagrams.

(c) Power plant design shall provide schematic flow diagrams of all piping systems including major pieces of equipment and necessary controls, and a floor plan indicating the location of major pieces of equipment.

(d) Boiler Plant and/or incinerator designs shall comply with all requirements of the Department of Environmental Protection, and all applicable agency regulations and the building code.

(e) All ductwork shall be shown double line, unless otherwise approved in writing by DCAM.

(f) Heat loss calculations

(8) Electrical Drawings

(a) All service connections and electrical equipment (panels, transformers and switch gear) shall be located on the drawings.

(b) Lighting shall be indicated as to type, location and intensities in foot candles for each space, room, or typical space.

(c) All services for special purposes shall be located and indicated.

b) Submit all drawings in CAD format

3. Specification Requirements

a) The Design Development Specification shall consist of a comprehensive description of the project and the materials proposed for use in the work. No detailed specifications of materials or workmanship procedures need be included; however, the general scope shall be indicated by sections as required for Construction Specifications. The Specification shall include a comprehensive "Basis of Design" for coordinating the various criteria to satisfy the needs of the program. The "Basis of Design" shall be a narrative description of the project and shall include all applicable architectural, civil, structural, mechanical and electrical programs and/or systems.

b) The following is a list of items which shall be considered in this phase of design:

(1) Site Work: clearing, drives, walks, parking areas, fences, excavation, backfill, planting.

(2) Footings: on earth, rock, piles, caisson, proposed bearing pressures, boring logs, reason for adopting system proposed.

(3) Foundation walls: type of concrete, reinforcing, type and extent of waterproofing.

(4) Footing drains: type, disposal of drainage.

(5) Exterior walls: superstructure, type, materials, brick type and coursing, alternate cladding, back-up materials, damp proofing material and extent, special features.

(6) Roofs: types, vapor barrier, insulation, flashings, materials.

(7) Flashings: general types, materials, weights, where each type is to be used.

(8) Sheet metal: gutters, leaders, other uses, except flashings,

(9) Windows: general types, materials, section weights, sub-frames, finish, glazing, screens.

(10) Doors**,** exterior and interior: types and thicknesses,

(11) Steps, exterior: including platforms and landing materials.

(12) Stairs, interior: including platforms, landings, wall materials and finishes.

(13) Framing: wood or metal systems in accordance with general design requirements.

(14) Partitions: materials, thicknesses, and finishes.

(15) Cabinet and casework: types and materials.

(16) Food Service equipment: types and materials.

(17) Furring: lathing, plastering, materials and location.

(18) Thermal insulation: type, thickness, method of application and location.

(19) Acoustical treatment: type**,** thickness, method of application and location.

(20) Interior finishes: material for floors, walls, bases, wainscots, trim, and ceilings.

(21) Fire protection: standpipe systems, sprinkler systems, fire pump**s** and accessories.

(22) Water supply: source, location of main to which connection will be made, type of pipe for service main, load requirements, load factor and pressure.

(23) Sanitary sewers: sewage disposal system, pipe and other materials.

(24) Storm sewers: storm drainage disposal system (institution or local facility), pipe and other materials.

(25) Gas main: material, size, and location.

(26) Plumbing systems: wastes, vents, hot water, cold water, gas, air, oxygen, vacuum, main source of supply, materials for each, water heaters, pumps, thermal insulation, fixture quality, all special features.

(27) Heating, ventilating and air conditioning: type of heating and refrigeration plants, type and capacity of boilers and cooling equipment, efficiency rating, fuel, grade and oil, estimated annual fuel use, type of burners, fuel storage, heaters, feed water pumps and heaters, thermal insulation, type of heating medium, supply and return piping, radiation, unit heaters, radiant heating, air conditioning, special features.

(28) Electric work; service connection, location, institution or public utility, overhead or underground, transformers including type and location, types of conduit and wiring, types of fixtures, location of main switchboard, specials such as doctors and nurses call systems, radio, fire alarm, telephone, public address, emergency lighting and wiring, emergency or other generators, special features, including Master TV information retrieval and/or data processing system.

(29) Elevators, escalators, dumbwaiters and platform lifts; capacities, speed, travel in feet, landings, operation, controls, platform sizes, ,machine type and locations car and entrance finishes, signals.

(30) Other built-in equipment, types and materials.

(31) Special features.

(32) Hardware and keying requirements.

4. Estimating Requirements

a) During the Design Development phase, cost estimates shall be developed in as much detail as the drawings and specifications permit.

b) A total cost for each Section of the Specification shall be included.

c) The estimate shall reflect the current construction cost. The total cost shall include a contingency factor, as determined by the Designer. The anticipated bid date will be verified by DCAM with the Designer's input. The Designer shall include all inflation/escalation factors.

d) Summary sheets shall be developed which shall contain each Section of the work as well as the following:

(1) The date that the estimate was prepared (Value Date).

(2) The anticipated bid date.

(3) The project and contract number.

(4) The title and location of project,

(5) The name of the Designer.

(6) The name of the Estimator.

(7) The site cost (including all utilities).

(8) The building cost (including fixed equipment).

(9) The estimated construction cost of each section of the work, with a subtotal for each section and a total for all sections. After the total figure, indicate overhead and profit mark-ups (OH&P) and designate the amount as estimated Construction Cost (ECC). After OH&P mark-up figure, indicate the projected escalation to the mid-point of construction and designate the amount as the Fixed Limit Construction Cost (FLCC).

(10) The gross square footage of building.

(11) The net square foot cost of building.

(12) Ratio of net to gross square footage.

(13) Unit user cost (student, bed, inmate, etc.).

(14) Estimated number of calendar days required for construction of the project.

e) Refer to **APPENDIX K.**

5. Product Requirements

a) Provide two copies of catalogs sheets, brochures, diagrams, schedules, performance charts, illustrations of materials, assemblies and systems specified, and MSDS sheets (where applicable) and other standard descriptive data, assembled in a loose-leaf binder with tabs for each specification section, and updated when a change occurs. Physical material samples of specified materials shall be furnished to DCAM upon request.

b) Prepare color boards to illustrate all of the proposed finish materials.

E. CONSTRUCTION DOCUMENTS - PHASE 3

1. General

a) The Specifications shall be in final form and the Basis of Design that accompanied the Outline Specifications in the Schematic and Design Development Phases shall be updated and expanded to include all architectural, structural, civil, mechanical and electrical calculations for the project. This document shall be part of the Construction Documents - Phase 3 requirements and shall be available for submission upon request from DCAM.

b) Provide the following on the appropriate drawings:

(1) A small-scale, legible key plan adjacent to the title box on all drawings showing section locations, when the floor plan to which the sections apply are on another sheet. The key plan shall indicate the drawing number of the sheet where the section was taken.

(2) Show legends of materials, symbols, and abbreviations for each classification of drawings.

c) Insert, in the title box of all construction drawings, the date on which the drawings were approved by DCAM as indicated by the approval date on the title sheet.

(1) The Designer shall insert progress submission dates above the title box.

(2) The revision box is intended for use in the event of an approved revision.

2. Drawing Requirements

a) Site drawings shall indicate the following:

(1) Layout and location of all proposed work including buildings, structures, retaining walls and other site improvements with details.

(2) Existing and proposed grades and contours including floor elevations, existing structures and topography, survey base line, bench marks, boring and test pit locations, and site profile sections.

(3) Landscaping and planting including contract limit line and storage area for construction materials.

(4) Final Life Cycle Analysis

a) Life cycle analysis shall compare alternative systems including attention to energy conservation measures.

(5) Information necessary to prepare application for utility rebates including, but not limited to: lighting, motors, variable speed drives, HVAC efficiency.

6) All utility service lines, systems and structures for electricity, gas, oil, water, steam,

telephone, sanitary and storm drainage including size, composition, grades and directions of flow.

*[Note to Designer: Use a separate site **drawing** to show utilities on projects with excessive layouts and details]*.

(7) The Designer shall certify, in writing, to DCAM that all applicable local and state officials have been contacted regarding each utility connection and that the department responsible for permits or connection approval has agreed to the system's use.

(8) Provide curb cuts to allow access for the physically handicapped. Indicate handicapped parking and signage when required to provide an accessible path of travel.

b) Architectural drawings shall indicate the following:

(1) Floor plans of each floor, with room and corridor dimensions, wall thickness, column locations, floor elevations, mechanical and electrical openings, door and window designations and schedules.

(2) Room finish schedules that clearly designate types of materials and limits. Abbreviations may be used to indicate the materials.

(3) Roof plan showing openings, drainage, pitch, expansion joints and all projections, including equipment.

(4) Key plans on all floor plans and section drawings.

(5) Reflected ceiling plans.

(6) Legend of materials, abbreviations and symbols.

(7) Wall sections indicating dimensions, flashing, anchorage, reinforcing, coursing, cladding, and other details showing all conditions.

(8) Exterior and interior elevations and cross-sections including floor to ceiling heights. Designate all items of materials.

(9) Details for roofing, flashing, insulation, windows, doors, entrances, interior and exterior walls, expansion, control or construction joints, water stops, stairs, handrails, millwork and built-in equipment.

(10) Locations of all major mechanical and electrical penetrations through walls and floors

(11) Access provisions for servicing mechanical and electrical equipment in mechanical rooms. Provide metal walkways, catwalks, ladders, etc. as required to provide access.

[Note to Designer: The installation of all metal walkways, catwalks, ladders, handrails and stairways shall be furnished and installed by the Miscellaneous and Ornamental Iron Subcontractor.]

c) Structural drawings shall indicate the following:

(1) Coordinate the following items with the site plan: Boring plans with dates, ground elevation water level, and bottom grades of footings and slabs.

(2) Foundation plan with bottom grades showing layout of all footings, walls, slabs on grade including reinforcing, grade beams, and columns; include design soil bearing pressures and live loads for each area.

(3) Floor and roof plans of structural systems including framing, elevation of finished floors and depressed areas, with locations and dimensions for all openings. Indicate design floor loads.

(4) Complete foundation wall elevation and typical sections with reinforcing, indicating location, dimensions and grades for all footings, steps and wall openings.

(5) Complete details and sections with dimensions for all construction including expansion and construction joints, reinforcing and other embedded items.

(6) Schedules (with dimensions) for all lintels, beams, joists and columns.

(7) Unless detailed on the drawings, the following information shall appear in the general notes. Sheet S-1: class and 28 day strength of concrete for each portion, structural steel and concrete reinforcing design stresses for each type of structural member, concrete cover for each type of structural member, shrinkage and temperature steel requirements, reinforcing laps for main reinforcing and temperature steel, bend point, cutoff, and hook locations for all members, minimum beam and lintel bearing. Reinforcing steel fabrication shall be in accordance with most recent ACI, "Manual of Standard Practice for Detailing Reinforced Concrete." Structural steel fabrication shall be in accordance with the AISC "Manual of Steel Construction."

(8) Roofs shall not be dead level. They shall have a minimum slope of ¼" per foot to roof drains. This may be accomplished by either sloping the structure or by using sloped insulation. Two roof drains are preferable to one (incase of blockage of one drain) and if a parapet is used relief scuppers should be employed to limit the height of water build-up.

d) Fire protection drawings shall indicate standpipe systems, sprinkler systems, access panels, fire pumps and accessories.

(1) Fire Protection work, other than site work, shall not be combined on the same sheets with the Plumbing, HVAC, Electrical, or other drawings except with the prior approval of DCAM.
(2) Fire protection system calculations and narrative report, as required by 780 CMR, shall be provided.

e) Plumbing drawings shall indicate the following:

(1) All work done by the Plumbing Subcontractor shall include all water, gas, air, vacuum, sanitary and storm wastes, and accessories. Foundation drain lines are the work of the General Contractor and shall not be indicated on the plumbing drawings. Site utilities shall be indicated on the utility drawings.

(2) Plumbing work, other than site work, shall not be combined on the same sheets with the Fire Protection, HVAC, Electrical, or other drawings except with the prior approval of DCAM.

(3) Trapping and venting of all plumbing fixtures including floor drains.

(4) Water and gas supply sources, storm and sanitary discharge mains.

(5) All piping shall be carefully sized, and all sizes shall be indicated on drawings and riser diagrams. Indicate all directions of flow and pitch on piping.

(6) All accessories, valves, fixtures including all drinking fountains, grease traps for kitchen waste and all necessary panels, identified as to type and size.

(7) Acid waste and vents for laboratories conforming to the requirements of the latest issue of the State Examiner of Plumbers.

(8) Plumbing Legend and/or graphical symbols on the first sheet of the plumbing drawings in accordance with the National Standards Institute (ANSI).

(9) Plumbing riser diagrams for structures two or more stories in height above ground level.

(10) Domestic water booster pumps, boiler feed water, meter location, hose bibs.

(11) Hot water: storage tanks, piping material, hanger details.

(12) Back-flow preventors in accordance with requirements of Department of Environmental Protection (DEP)

(13) Clean outs in accordance with the Mass. State Plumbing Code.

[Note to Designer: Typical illustrations are available at the office of the Board of State Examiners of Plumbers].

f) Heating, Ventilating and Air Conditioning drawings shall indicate the following:

(1) Site utilities shall be indicated on the utility drawings.

(2) HVAC work, other than site work, shall not be combined on the same sheets with Fire Protection, Plumbing, Electrical, or other drawings except with the prior approval of DCAM.

(3) All piping and ductwork systems shall be located and sized.

(4) All systems shall be sized at all reductions and riser diagrams of piping and duct systems shall be indicated.

(5) All directions of flow and pitch on piping, and direction of flow, volumes for duct systems shall be indicated.

(6) All large items of equipment shall have sufficient servicing and/or replacement space indicated on drawings.

(7) All equipment, accessories, valves and dampers with all necessary access panels, identified as to type and size. Access panels, where required for access to valves and dampers, etc., shall be indicated on drawings.

(8) Cooling system pumps, chillers, cooling towers, air handling units, ductwork system and dampers, fan details, temperature control system, air and hydronic balancing equipment, and schedules shall be indicated.

(9) Cooling tower design shall be indicated on the drawings showing site location, elevations and floor plan of equipment layout and typical flow diagram as related to the total HVAC system.

(10) Adequate ventilation shall be provided in utility tunnels. Ventilation for exterior utility tunnels shall be indicated on the utility drawings.

(11) All fire and smoke dampers, access panels and doors shall be installed in accordance with the latest edition of NFPA Code 90.A.

(12) Mechanical room designs:

(a) Vent pipes for safety valves, relief valves, back pressure valves and tanks shall be extended above flat roofs in accordance with all governing authorities.

(b) In all designs for boiler and refrigeration plants, include a complete floor plan indicating location of all major mechanical equipment and sufficient service space.

(c) In all designs of new and/or replacement boiler and refrigeration plants, provide a flow diagram detailing steam or hot water distribution systems, return systems, including all existing equipment and their function, as well as any proposed expansions with all necessary instrumentation and controls.

(13) All ductwork shall be shown double line unless otherwise approved in writing by DCAM.

g) Electrical drawings shall indicate the following:

(1) Site utilities shall be indicated on utility drawings.

(2) Electrical work, other than site work, shall not be combined on the same sheets with Fire Protection, Plumbing, HVAC, or other drawings except with the prior approval of DCAM.

(3) General arrangement: Outline layout of each floor. Typical sections through the structure, floor and ceiling heights and elevations, and type of construction, including concrete pads shall be indicated.

(4) Interior lighting system: type of wiring, light fixture schedules, location and mounting heights of all fixtures, receptacle and switch outlets, sizes and types of all lamps, conduits, all other accessories and riser diagrams shall be indicated on the drawings. Indicate details and method of supporting electrical fixtures and conduits. Designer shall specify that all electrical lighting fixtures be supported from 'the building structure, and shall be independent of ducts, pipes, ceilings and their supporting members.

(5) Power system: locations, types, and method of control for all motors, heaters, appliances, controllers, starters, branch circuits, feeder conductors and conduits. Indicate riser diagrams. Show details and indicate method of supporting electrical conduit. For larger projects, thermostats and control wiring are normally covered under the HVAC contract.

(6) Signal systems: locations and types of all outlets and equipment, service connections, wiring diagrams, all other essential details.

(7) Services: location and details of all services, whether overhead or underground, feeder sizes, plans and elevations of switch gear and transformers, metering and service switchboard arrangements, wiring and ground fault diagram and bus ducts.

(8) Generator and sub-stations: Location, size, method of connection and protection of all generators, transformers, exciters, rotor generators, switch gear, and associated equipment, current characteristics and equipment capacities. Indicate equipment connections by means of one 'line and/on wiring diagrams and schedule all major items of equipment and all instruments.

(9) Underground work: the sizes and locations of manholes and types of cables, number, size and location of ducts, locations, sizes and types of cable supports, fireproofing, duct line profile, and one line diagram of connections. All underground chambers, including manholes and pull-boxes, shall be constructed of cast in place or one piece pre-cast concrete.

(10) Pole line work: location, length, treatment and class of poles, guying, cross arms, insulators, circuiting, transformers, protective and switching devices, lighting arrestors, special structures, diagrams, current characteristics and grounding.

(11) Exterior lighting: location, size, and types of transformers, luminaries, poles, light standards, cables, ducts, and manholes, details of control equipment and connection diagrams.

(12) Emergency system: details including transfer switch and type of fuel.

(13) One line diagram indicating load in KVA, and available short circuit amperes at each transformer, switchboard, distribution panel board, branch circuit panel board, and at major pieces of equipment.

(14) Riser diagrams for all systems.

h) Erosion Control and Sedimentation Control Drawings shall include:
(1) Engineering drawings, stamped by professional engineer indicating the work.
(2) Erosion control plan consistent with DEP's best management practices. **(Refer to Appendix O)**

i) Prior to submitting the Construction Documents to DCAM, the following steps shall be completed, as applicable:

(1) For State Projects:

(a) Two sets of the drawings and specifications shall be stamped "Approved" and signed by the appropriate State Building Inspector from the Department of Public Safety (DPS).

(b) The Plumbing drawings and specifications shall be signed and stamped "Approved" by the Board of State Examiners of Plumbers and Gas Regulations Board. The local Fire Chief shall approve, stamp and sign the Fire Protection, HVAC and Electrical construction documents. The local Electrical Inspector shall approve, stamp and sign Electrical construction documents.

(2) For County Projects:

(a) Two sets of the construction documents shall be approved and signed by the local building official, the Local Plumbing Inspector, the Local Electrical Inspector and the local Fire Chief in the same manner as indicated above.

(3) All other approvals of State or Federal agencies having jurisdiction shall also be obtained.

(4) The sets containing the original approvals will be retained by DCAM as the official approved sets.

(5) All documents that have been revised after being stamped shall be replaced and the procedure shall be the same as described above.

j) Quality Control Drawings
1) Provide a floor plan of each floor indicating plumbing, HVAC, sprinklers, emergency systems and lighting each plotted in a different color on the same sheet to highlight possible coordination conflicts between trades, and sufficient vertical sections (duct cross-overs and beam obstructions) to indicate all areas of potential conflict not evident in plan view.

2) Other approved method to ensure quality control and coordination of contract documents. A requirement for contractor supplied coordination drawings does not waive this requirement.

3. Specification Requirements

a) Type in the date on which the Specifications were approved by DCAM in the lower right hand corner of the title sheet.

[Note to Designer: this date corresponds to the C-9 date]

b) The following general information applies to the development of final Specifications:

(1) Describe the extent of the work, the materials and workmanship, and include the work under the proper Section. If any portion of the work included in a Section of the Specifications is to be performed by a trade covered by another Section, there shall be clear and distinct cross referencing between the Sections. Merely to state "by others" is not acceptable.

(2) Provide for competition for each item of material to be furnished. Bidders shall not be required to submit proposed “or equal" products for approval prior to the bid date.

(3) Provide for either a minimum of three manufacturers of material or a description of material which can be met by a minimum of three manufacturers.

(a) Add the words "or equal" after at least three (3) manufacturers and the acceptable trade name, plate or catalog number of each.

(4) Specify materials mined or manufactured in Massachusetts whenever possible.

(5) Do not use general clauses intended to be all-inclusive in lieu of complete descriptions.

(6) Do not duplicate standard requirements that are contained in the contract form.

(7) Use consistency throughout. Use the word "will" to designate what the Commonwealth or the Designer can be expected to do and the word "shall" to designate what is mandatory for the Contractor to do.

(8) Use the same term throughout for the same subject, and the term shall be the same as that used on the drawings.

(9) Do not use the term “etc.”

(10) Avoid such terms as "to the satisfaction of the Designer," "as directed by the Designer," "as approved," and "as required."

(11) Specify work in appropriate Sections according to local trade jurisdiction.

(12) In Sections for which filed sub-bids are required, refrain from using such terms as "the Contractor," the "Heating Contractor," or "'the Plumbing Contractor," but where necessary for clarity refer to the "HVAC Subcontractor," the "Plumbing Subcontractor", or other subcontractor.

(13) Do not give numbers both in words and figures. Numbers less than 10 shall be written in words, 10 and higher numbers shall be written in figures. In expressing dimensions, figures such as 2 in., 16 in., 7 ft. 6 in., shall be used.

(14) Do not use Federal Specifications numbers without approval of DCAM.

(15) Each filed Sub-bid Section shall detail all labor and materials required by that particular sub-trade and list, by number, those drawings indicating work of that sub-trade. In addition, list drawings indicating work of a particular trade that appear on drawings that are not customarily included in the work of that trade.

(16) Do not specify that a product or system shall require pre-qualification for use prior to bidding.

(17) Do not use words that preclude the use of recycled materials (i.e. “virgin materials).

(18) Specify that the contractor shall provide inventory information for all major mechanical and HVAC, electrical and special equipment which includes the following:

a) Equipment type
b) Equipment description
c) Manufacturer
d) Model Number
e) Serial Number
f) Building and Location of the Equipment

(19) Specifications should be tailored to the specific project. Delete sections and references that do not apply.

c) Special Specification Requirements:

(1) Proprietary products shall not be specified except as provided by Chapter 30. Section 39M, of the Massachusetts General Laws. The law states that a proprietary specification may be written for sound reasons in the public interest, and shall be written in the public record of the awarding authority, after a reasonable investigation is conducted. Patented or proprietary products, if approved in writing by DCAM, may be part of the base Specifications or may be specified as an alternate.

[Note to Designer: HVAC controls, elevator controls, and lock hardware are common proprietary items specified]

(2) Alternates, if approved in writing by DCAM, shall be properly described and cross-referenced in the specifications and drawings. An alternate proposal sheet shall be

prepared by the Designer for insertion into the contract form (**Refer to Alternate Section 01030 Appendix I)**

(3) The use of Allowances is not allowed under Massachusetts public bidding law.

(4) Unit price items, if permitted or ordered by DCAM, shall be properly described in the Specifications. A unit price proposal sheet shall be prepared for the General Contractor's proposal in accordance with the form shown herein (**Refer to Appendix H)**. When a unit price item is the work of a Filed Sub-Bidder, information shall be included in the applicable Section with instructions for the Sub-Bidder to insert the unit price amounts in the proposal sheet attached to the Form for Sub-Bid (**Refer to Appendix Ha)**

4. Estimating Requirements

a) During the Construction Document phase, cost estimates shall be in complete detail with totals for each Section of the Specifications under Steps C l , C6 and C10, as noted. Cost estimates shall include complete breakdowns of each Section including Fire Protection, Plumbing, HVAC, and Electrical, indicating materials, labor, units, unit costs and total cost. The total cost shall include in the labor item all insurance, state and federal payroll taxes, and any payments to unions. The total cost for each Section shall include all General Contractors' and Subcontractors' overhead and profits.

b) Cost estimate in the Construction Documents phase is subject to DCAM's approval.

c) The date of the estimate shall be the date of the submittal. The detailed estimate cost shall not be projected.

d) The summary sheets shall be developed, which shall contain the following (**Refer to Appendix K)**:

(1) The date that the estimate was prepared. (Value Date)

(2) The anticipated bid date.

(3) The project and contract number.

(4) The title and location of the project.

(5) The name of the Designer.

(6) The name of the Estimator.

(7) The site cost (including all utilities).

(8)The building cost (including fixed equipment).

(9)The estimated construction cost of each Section of the work, totaled.

(10) The costs of Item 1(General Contractor Work) and Item 2(Sub-contractor Work) work, included in the General Contractor's bid forms, shall be individually totaled.

(11) The gross square footage of the building.

(12) The gross square foot cost of the building excluding all site work and utility lines 10 feet beyond the building wall.

(13) Ratio of net to gross square footage.

(14) Estimated number of calendar days required for the construction of the complete project.

(15) General Contractor's overhead and profit.

e) In order to maintain uniformity in computation and consistency of both gross and net square foot areas of buildings, they shall be determined in the following manner:

(1) Gross Areas: Refer to the definitions, Section 1A.

(2) Net Areas: Refer to the definitions, Section 1A.

f) The volume of the building will generally not be required, except for demolition projects.

g) The volume of demolition projects shall be the gross area of the building times the following:

(1) Heights: From bottoms of lowest floors to highest points of flat roofs, or to half-heights of pitched roofs.

(2) Volume of Porches: One-half height multiplied by area.

(3) Volume of Steam Trenches and- Utility Tunnels: one-half of volume.

5. Bidding and Award

a) The Designer shall review and recommend to DCAM the qualifications of the General Contractors.

b) The Designer shall prepare all addenda during the bid period.

(1) All questions by prospective bidders as to the interpretation of the Notice to Contractors, forms of proposal, forms of contract, drawings, specifications or form of performance bond and labor and materials or payment bond shall be submitted in writing to DCAM with a copy to the Designer.

(2) The Designer shall immediately draft a response to DCAM relative to all questions and shall include its recommendations for possible inclusion in an addendum.

(3) The Designer shall compute, establish and itemize the added cost or deduction to the estimated contract price for all items to be included in the addendum.

(4) The necessity and cost of the proposed addendum shall be written in a separate letter provided that DCAM has been verbally informed as to the necessity and cost.

(5) The addendum shall be clearly typed on good quality unfolded bond paper and delivered to DCAM at least seven working days prior to the receipt of sub-bids or if no sub-bids are involved, seven working days prior to the receipt of general bids.

(6) Addendum pages, including any drawings, shall be numbered consecutively with total attachments indicated on each page, ie. page 1 of 8,. page 2 of 8, -- page 8 of 8.

(7) (**Refer to Appendix J**) for sample addendum format.

c) The Designer shall attended sub-bid openings.

d) The Designer shall review and evaluate sub-bids.

e) The Designer shall attend General Contractor bid opening.

f) The Designer shall review and evaluate general bids.

g) The Designer shall review qualifications of the lowest responsible, eligible general bidder and submit it's reviews in writing to DCAM.

F. DESIGNER'S SERVICES DURING CONSTRUCTION - PHASE 4

1. Procedures During Construction

a) The Designer shall act as an agent of DCAM and administer the construction contract throughout the entire construction phase, as follows (refer to the contract for Designer's services):

(1) Attend pre-construction conference.

(2) Prepare and distribute the minutes of all meetings (**Refer to Appendix B**)

(3) Conduct weekly project meetings with Consultants in attendance.

(4) Review the Schedule of Values and recommend approval.

(5) Review the Progress Schedule and recommend approval.

(6) Review and approve shop drawings and samples.

(7) Conduct timely work progress inspections with Consultants.

(8) Review record drawings monthly.

(9) Recommend approval of non-filed sub-bids.

(10) Evaluate and recommend General Contractor's monthly payments.

(11) Participate in Form 16 (request for payment on stored materials) approval.

(12) Prepare request for proposals for change orders.

(13) Review and recommend change orders submitted

(14) Recommend an extensions of time.

(15) Solicit proposals for and monitor applicable construction testing.

(16) Enforce the Contract requirements for periodic project progress photographs.

(17) Monitor General Contractor's performance.

(18) Provide all clarifications to Contract Documents.

2. Contract Close-out Procedures

a) The Designer shall review record drawings for final inspection and incorporate all as-built conditions onto the electronic drawing files, layered, and colored as prescribed in the CAD layer guidelines.

b) The Designer shall upon notification by General Contractor that less than one percent of the work remains to be completed, conduct a semi-final inspection.

c) The Designer shall establish a final punch list and monetize same.

d) The Designer shall recommend amount of semi-final payment to the General Contractor.

e) The Designer shall review all operations and maintenance data and forward to User Agency.

f) The Designer shall confirm that operations and maintenance instructions have been given to proper User Agency personnel.

g) The Designer shall review all guarantees and warranties beyond the normal one-year guarantee and forward to User Agency.

h) The Designer shall confirm that spare parts, maintenance materials and replacement products have been delivered to the User Agency.

1) The contractor shall provide inventory information for all major mechanical, electrical, and HVAC equipment in electronic format (word processor, spread sheet, or data base). The inventory shall include: equipment type, equipment description, manufacturer, model number, serial number, and the location of the equipment.
2) The contractor shall also provide preventative maintenance procedures and schedules for all such equipment based on manufacturers' recommendations.

i) The Designer shall insure that appropriate documentation is submitted and proper inspections have taken place to secure a Department of Public Safety Occupancy Permit.

j) The Designer shall sign final acceptance papers, sign an affidavit of compliance that certifies that the construction has been inspected and that it complies with the contract documents and all the regulations of the Massachusetts Building Code.

k) The Designer shall for use and occupancy provisions, apply applicable steps indicated above.

l) The Designer shall evaluate General Contractor's performance.

m) The Designer shall prepare an analysis of the project to include the following: building square footage, total construction cost including change orders, adjusted summary schedule of values by specification section with section cost/sf., sub-bid costs, and a list of fee and no fee change orders.

SPECIFICATION FORMAT

A. SPECIFICATION OVERVIEW

1. DCAM has adopted the most recent version of the CSI format for (a) the organization, numbering and titling of Specification Sections and (b) the internal organization of information and data within an individual Specification Section (SECTION FORMAT: Three-Part Section Format for Construction Specifications). It has been necessary to modify some CSI criteria to comply with the intent of the Commonwealth's Bid Laws, Massachusetts General Laws Chapter 149, Section 44F which requires certain classes of work to be filed sub-bid if the estimated cost of such work exceeds $10,000.00. The number and Section title changes occur only when work items are related to Filed Sub-Bid Sections. The reasons for the changes are to clearly identify and include all the work of a trade within a single Filed Sub-Bid Section. The Designer, with DCAM's approval, may elect to modify the CSI format and include more than one Section for each required filed sub-bid. Modifications in Three-Part Section article and paragraph titles have been made to include mandatory information in a Specification Section or to reflect titles and information deemed essential by DCAM based on established procedures or recommended practices.

2. All specifications shall include the following language regarding compliance with the year 2000 relating to products, services and systems, and the interface with an existing system or the system of an outside entity:

   a. The contractor represents and warrants that the information technology for this contract is year 2000 compliant. Year 2000 compliant means information technology that accurately processes date/time data (including but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and years 1999 and 2000 and leap year calculations. Furthermore, Year 2000 compliant information technology, shall accurately process date/time data if the other information technology properly exchanges date/time data with it. This warranty shall survive the expiration or termination of this contract.
   b. The contractor represents and warrants that this system and all interfaces to this system that the contract is providing, including but not limited to interfaces with other systems and data entry interface for this system are Year 2000 compliant. Year 2000 compliant means information technology that accurately processes date/time data (including but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and years 1999 and 2000 and leap year calculations. Furthermore, Year 2000 compliant information technology, shall accurately process date/time data if the other information technology properly exchanges date/time data with it. This warranty shall survive the expiration or termination of this contract.

3. Filed Sub-bids Sections:

DIVISION 4 - MASONRY

* 04101 MASONRY

** 04401 STONE

DIVISION 5 - METALS

* 05101 MISCELLANEOUS AND ORNAMENTAL IRON

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

* 07101 WATERPROOFING, DAMPPROOFING AND CAULKING

* 07201 ROOFING AND FLASHING

DIVISION 8 - DOORS AND WINDOWS

* 08501 METAL WINDOWS

* 08801 GLASS AND GLAZING

** 08901 GLAZED CURTAIN WALLS

DIVISION 9 - FINISHES

* 09201 LATHING AND PLASTERING

* 09301 TILE

* 09401 TERRAZZO

* 09501 ACOUSTICAL TILE

** 09600 STONE FLOORING

** 09680 CARPET

* 09601 MARBLE

* 09701 RESILIENT FLOORS

* 09901 PAINTING

DIVISION 11 - EQUIPMENT

** 11400 FOOD SERVICE EQUIPMENT

DIVISION 13 - SPECIAL CONSTRUCTION

** 13900 FIRE SUPPRESSION AND SUPERVISORY SYSTEMS

DIVISION 14 - CONVEYING SYSTEMS

* 14201 ELEVATORS

DIVISION 15 - MECHANICAL

* 15301 FIRE PROTECTION

* 15401 PLUMBING

* 15501 HEATING, VENTILATION AND AIR CONDITIONING

DIVISION 16 - ELECTRICAL

* 16101 ELECTRICAL WORK

* DENOTES FILED SUB-BID REQUIRED.

** DCAM WILL DETERMINE IF FILED SUB-BID IS REQUIRED.

*[Note to Designer: Due to Massachusetts Filed sub-bid laws, it may be necessary to combine several sections under one division number, typically the section will end in a "1" to denote a filed sub-bid, eg. 1610**1**]*

[Note to Designer: If unit prices are requested under a filed sub-bid a unit price sheet must be included in the filed sub-bid section **(Refer to Appendix Ha)***]*

B. TYPICAL SECTION TITLES

DIVISION 1 **GENERAL REQUIREMENTS**

01010 SUMMARY OF THE WORK

01025 UNIT PRICES

01030 ALTERNATES

01300 SUBMITTALS

01400 QUALITY CONTROL

01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

01600 MATERIAL AND EQUIPMENT

01700 CONTRACT CLOSEOUT

DIVISION 2 **SITE CONSTRUCTION**

02050 BASIC SITE MATERIALS AND METHODS

02051 DEMOLITION *

[Designer's Note: General demolition is normally General Contractor work, with disconnection by the filed sub-bids, each filed sub-bid should have disconnection and capping of utilities]

02100 SITE REMEDIATION

02200 SITE PREPARATION

02300 EARTHWORK

02400 TUNNELING, BORING, AND JACKING

02450 FOUNDATION AND LOAD-BEARING ELEMENTS

02500 UTILITY SERVICES

02600 DRAINAGE AN[) CONTAINMENT

02700 BASES, BALLASTS, PAVEMENTS, AND APPURTENANCES

02800 SITE IMPROVEMENTS AND AMENITIES

02900 PLANTING

02950 SITE RESTORATION AND REHABILITATION

DIVISION 3 **CONCRETE**

03050 BASIC CONCRETE MATERIALS AND METHODS

03100 CONCRETE FORMS AND ACCESSORIES

03200 CONCRETE REINFORCEMENT

03300 CAST-IN-PLACE CONCFIETE

03400 PRECAST CONCRETE

03500 CEMENTITIOUS DECKS AND UNDERLAYMENT

03600 GROUTS

03700 MASS CONCRETE

03900 CONCRETE RESTORATION AND CLEANING

DIVISION 4 **MASONRY**

* 04101 MASONRY

04050 BASIC MASONRY MATERIALS AND METHODS

04200 MASONRY UNITS

** 04401 STONE

04500 REFRACTORIES

04600 CORROSION-RESISTANT MASONRY

04700 SIMULATED MASONRY

04800 MASONRY ASSEMBLIES

04900 MASONRY RESTORATION AND CLEANING

DIVISION 5 **METALS**

05050 BASIC METAL MATERIALS AND METHODS

05100 STRUCTURAL METAL FRAMING

* 05101 MISCELANEOUS AND ORNAMENTAL IRON

05200 METAL JOISTS

05300 METAL DECK

05400 COLD-FORMED METAL FRAMING

05500 METAL FABRICATIONS

05600 HYDRAULIC FABRICATIONS

05650 RAILROAD TRACK AND ACCESSORIES

05700 ORNAMENTAL METAL

05800 EXPANSION CONTROL

05900 METAL RESTORATION AND CLEANING

DIVISION 6 **WOOD AND PLASTICS**

06050 BASIC WOOD AND PLASTIC MATERIALS AND METHODS

06100 ROUGH CARPENTRY

06200 FINISH CARPENTRY

06400 ARCHITECTURAL WOODWORK

06500 STRUCTURAL PLASTICS

06600 PLASTIC FABRICATIONS

06900 WOOD AND PLASTIC RESTORATION AND CLEANING

DIVISION 7 **THERMAL AND MOISTURE PROTECTION**

07050 BASIC THERMAL AND MOISTURE PROTECTION MATERIALS AND METHODS

* 07101 WATERPROOFING, DAMPPROOFING AND CAULKING

07200 THERMAL PROTECTION

* 07201 ROOFING AND FLASHING

07300 SHINGLES, ROOF TILES, AND ROOF COVERINGS

07400 ROOFING AND SIDING PANELS

07500 MEMBRANE ROOFING

07600 FLASHING AND SHEET METAL

07700 ROOF SPECIALTIES AND ACCESSORIES

07800 FIRE AND SMOKE PROTECTION

07900 JOINT SEALERS

DIVISION 8 **DOORS AND WINDOWS**

08050 BASIC DOOR AND WINDOW MATERIALS AND METHODS

08100 METAL DOORS AND FRAMES

08200 WOOD AND PLASTIC DOORS

08300 SPECIALTY DOORS

08400 ENTRANCES AND STOREFRONTS

* 08501 METAL WINDOWS

08600 SKYLIGHTS

08700 HARDWARE

* 08801 GLASS AND GLAZING

** 08901 GLAZED CURTAIN WALL

DIVISION 9 **FINISHES**

09050 BASIC FINISH MATERIALS AND METHODS

09100 METAL SUPPORT ASSEMBLIES

* 09201 LATHING AND PLASTER

09230 AGGREGATE COATINGS

09250 GYPSUM BOARD

* 09300 TILE

* 09400 TERRAZZO

09500 ACOUSTICAL TREATMENT

* 09501 ACOUSTICAL CEILINGS

09540 SPECIAL SURFACES

09550 WOOD FLOORING

** 09600 STONE FLOORING

09601 MARBLE

09630 UNIT MASONRY FLOORING

** 09680 CARPET

09700 SPECIAL FLOORING

* 09701 RESILIENT FLOORS

09780 SPECIAL FLOORING

09800 ACOUSTICAL TREATMENT

* 09901 PAINT

09950 WALL COVERING

DIVISION 10 **SPECIALTIES**

10100 VISUAL DISPLAY BOARDS

10150 COMPARTMENTS AND CUBICLES

10200 LOUVERS AND VENTS

10240 GRILLES AND SCREENS

10250 SERVICE WALLS

10260 WALL AND CORNER GUARDS

10270 ACCESS FLOORING

10290 PEST CONTROL

10300 FIREPLACES AND STOVES

10340 MANUFACTURED EXTERIOR SPECIALTIES

10350 FLAGPOLES

10400 IDENTIFICATION DEVICES

10450 PEDESTRIAN CONTROL DEVICES

10500 LOCKERS

10520 FIRE PROTECTION SPECIALTIES

10530 PROTECTIVE COVERS

10550 POSTAL SPECIALTIES

10600 PARTITIONS

10670 STORAGE SHELVING

10700 EXTERIOR PROTECTION

10750 TELEPHONE SPECIALTIES

10800 TOILET, BATH, AND LAUNDRY ACCESSORIES

10880 SCALES

10900 WARDROBE AND CLOSET SPECIALTIES

DIVISION 11 **EQUIPMENT**

11010 MAINTENANCE EQUIPMENT

11020 SECURITY AND VAULT EQUIPMENT

11030 TELLER AND SERVICE EQUIPMENT

11040 ECCLESIASTICAL EQUIPMENT

11050 LIBRARY EQUIPMENT

11060 THEATER AND STAGE EQUIPMENT

11070 INSTRUMENTAL EQUIPMENT

11080 REGISTRATION EQUIPMENT

11090 CHECKROOM EQUIPMENT

11100 MERCANTILE EQUIPMENT

11110 COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT

11120 VENDING EQUIPMENT

11130 AUDIO-VISUAL EQUIPMENT

11140 VEHICLE SERVICE EQUIPMENT

11150 PARKING CONTROL EQUIPMENT

11160 LOADING DOCK EQUIPMENT

11170 SOLID WASTE HANDLING EQUIPMENT

11190 DETENTION EQUIPMENT

11200 WATER SUPPLY AND TREATMENT EQUIPMENT

11280 HYDRAULIC GATES AND VALVES

11300 FLUID WASTE TREATMENT AND DISPOSAL EQUIPMENT

** 11400 FOOD SERVICE EQUIPMENT

11450 RESIDENTIAL EQUIPMENT

11460 UNIT KITCHENS

11470 DARKROOM EQUIPMENT

11480 ATHLETIC, RECREATIONAL, AND THERAPEUTIC EQUIPMENT

11500 INDUSTRIAL AND PROCESS EQUIPMENT

11600 LABORATORY EQUIPMENT

11650 PLANETARIUM EQUIPMENT

11660 OBSERVATORY EQUIPMENT

11680 OFFICE EQUIPMENT

11700 MEDICAL EQUIPMENT

11780 MORTUARY EQUIPMENT

11850 NAVIGATION EQUIPMENT

11870 AGRICULTURAL EQUIPMENT

11900 APPENDIX EQUIPMENT

DIVISION 12 **FURNISHINGS**

12050 FABRICS

12100 ART

12300 MANUFACTURED CASEWORK

12400 FURNISHINGS AND ACCESSORIES

12500 FURNITURE

12600 MULTIPLE SEATING

12700 SYSTEMS FURNITURE

12800 INTERIOR PLANTS AND PLANTERS

12900 FURNISHINGS RESTORATION AND REPAIR

DIVISION 13 **SPECIAL CONSTRUCTION**

13010 AIR-SUPPORTED STRUCTURES

13020 BUILDING MODULES

13030 SPECIAL PURPOSE ROOMS

13080 SOUND, VIBRATION, AND SEISMIC CONTROL

13090 RADIATION PROTECTION

13100 LIGHTNING PROTECTION

13110 CATHODIC PROTECTION

13120 PRE-ENGINEERED STRUCTURES

13150 SWIMMING POOLS

13160 AQUARIUMS

13165 AQUATIC FACILITIES

13170 TUBS AND POOLS

13175 ICE RINKS

13185 KENNELS AND ANIMAL SHELTERS

13190 SITE-CONSTRUCTED INCINERATORS

13200 STORAGE TANKS

13220 FILTERUNDERDRAINS AND MEDIA

13230 DIGESTER COVERS ANDAPPURTENANCES

13240 OXYGENATION SYSTEMS

13260 SLUDGE CONDITIONING SYSTEMS

13280 HAZARDOUS MATERIAL REMEDIATION

13400 MEASUREMENT AND CONTROL INSTRUMENTATION

13500 RECORDING INSTRUMENTATION

13550 TRANSPORTATION CONTROL INSTRUMENTATION

13600 SOLAR AND WIND ENERGY EQUIPMENT

13700 SECURITY ACCESS AND SURVEILLANCE

13800 BUILDING AUTOMATION AND CONTROL

13850 DETECTION AND ALARM

** 13900 FIRE SUPPRESSION AND SUPERVISORY SYSTEMS

DIVISION 14 **CONVEYING SYSTEMS**

14100 DUMBWAITERS

* 14201 ELEVATORS

14300 ESCALATORS AND MOVING WALKS

14400 LIFTS

14500 MATERIAL HANDLING

14600 HOISTS AND CRANES

14700 TURNTABLES

14800 SCAFFOLDING

14900 TRANSPORTATION

DIVISION 15 **MECHANICAL**

15050 BASIC MECHANICAL MATERIALS AND METHODS

15100 BUILDING SERVICES PIPING

15200 PROCESS PIPING

*** 15250 MECHANICAL INSULATION

* 15301 FIRE PROTECTION PIPING

* 15401 PLUMBING

15550 HEAT-GENERATION EQUIPMENT

* 15501 HEATING, VENTILATING, AND AIR CONDITIONING EQUIPMENT

15600 REFRIGERATION EQUIPMENT

15800 AIR DISTRIBUTION

*** 158400 DUCTWORK

*** 15900 HVAC INSTRUMENTATION AND CONTROLS

*** 15950 TESTING, ADJUSTING, AND BALANCING

DIVISION 16 **ELECTRICAL**

16050 BASIC ELECTRICAL MATERIALS AND METHODS

16100 WIRING METHODS

* 16101 ELECTRICAL WORK

16200 ELECTRICAL POWER

16300 TRANSMISSION AND DISTRIBUTION

16400 LOW-VOLTAGE DISTRIBUTION

16500 LIGHTING

16700 COMMUNICATIONS

16800 SOUND AND VIDEO

*** Denotes possible sub sub-bids if determined by DCAM (refer to definitions)

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C. THREE-PART SECTION FORMAT

l The Section Format

a) The Section provides for recognition of a basic unit of work. Any specific Section must answer three fundamental questions.

(1) What interrelationships have existed, do exist, or will exist between the unit of work and the remainder of the project or with any portion of the project?

(2) What is the product(s) involved in the unit of work?

(3) How is the product(s) incorporated into the work?

b) The function of each Part can be described briefly as follows:

(1) Part 1 covers those general areas of concern which relate to the work and which define the general administrative and technical requirements specific to a particular Section,

(2) Part 2 defines, in detail, the acceptable equipment, materials, fixtures, mixes, and fabrications, i.e., "product" items to be incorporated into the Work.

(3) Part 3 describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.

2 Titles of Section Parts

a) Titles for the three parts are comprehensive in nature. They are assigned to preserve a constant and logical order, and to allow for the many variables encountered from project to project. The following names are assigned:

PART 1: GENERAL
PART 2: PRODUCTS
PART 3: EXECUTION

3. Article Titles

a) Article titles, as recommended, can achieve uniformity as long as the sequence of titles is maintained. Specifiers should note that the listed titles should be selected only as needed to accommodate the subject matter required in each Specification Section being written. Where the listed titles will serve to accommodate the needs of a project, the building industry will benefit by adherence to these titles and the sequence in which they are listed.

b) Articles vs. Paragraphs

(1) Flexibility is a fundamental requisite in developing aids for the Designer. Titles proposed in this document place the information in related groups and in a consistent sequential nature. The Section Format recommends that the sequence of Information be followed. However, it leaves the determination as to whether the information takes the form of Articles with lower ranked Paragraphs or a series of Articles up to the Specification Writer and the complexity of the Specification Section.

4. Summary of the Three-Part Section Format

a) Titles listed in this summary represent categories of paragraphs used in current specification practice, Do not use titles inapplicable to the relevant Section, but maintain those that are used in the sequence shown. The location and sequence of titles under their respective Parts are as follows:

PART 1 - GENERAL	PART 2 - PRODUCTS	PART 3 - EXECUTION
Work Included	Acceptable Manufacturers	Inspection
Related Work	(Specify 3 Manufacturers	Preparation
System Description	or equal)	Installation/Applica-
Quality Assurance	Materials	tion/Erection
Reference Standards	Equipment	Field Quality Control
Submittals	Mixes	Adjusting & Cleaning
Delivery, Storage	Fabrication	Protection
and Handling		Extra Stock/Spare
Sequencing/		Parts
Scheduling		Operation and
Warranty/Guarantee		Maintenance Data
		Testing

[Note to Designer: The above articles listed in the Summary of the Three-Part Section Format are examples and may be altered to suit Section requirements.]

b) Each of the three Parts is grouped into distinct categories of related information. This discipline in organization combined with a consistent and uniform page format comprises the organizational structure of a section. By adherence to this total structure in the development of Specification Sections, the Designer is relieved of the time consuming task of organizing each individual Section as it is being written. Thus, the Designer's time can be spent more productively on the primary task of improving the true core of a Specification - the text.

D. FILED SUB-BID PROCEDURE EXAMPLE

SECTION [000001

[TITLE OF SECTION]

[Filed Sub-Bid Required]

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Time, Manner and Requirements for Submitting Sub-Bids:

1. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Division of Capital Planning and Operations at a time and place as stipulated in the "NOTICE TO CONTRACTORS,"

The following shall appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: _____
MASS. STATE PROJECT: _____, CONTRACT NO._____
SUB-BID FOR SECTION: _____
(No, and Title of Section)

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the Division of Capital Asset Management, as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the Division of Capital Asset Management, or may be obtained by written or telephone request [phone (617) 727-4003.

3. Sub-bids filed with the Division of Capital Asset Management shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Commonwealth of Massachusetts in the amount of five percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub-Sub Bid Requirements: *[Note to Designer: If Sub-Sub-Bids are not required.. omit subparagraphs 1 and 2 and insert: (NONE* REQUIRED UNDER THIS SECTION)]

(Omit if not applicable)

1. Sub-bidders attention is directed to Mass. G.L. Chapter 149, Section 44F as amended which provides in part as follows:

(Omit if not applicable**)**

a) Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the Section of the Specifications for that sub-trade) requires such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his/her own name in said paragraph E for any such class of work or part thereof and perform that work with persons on his/her own payroll; if such sub-bidder, after sub-bid openings, shows to the satisfaction of the awarding authority that s/he does customarily perform such class of work or the part thereof with persons on his/her own payroll and is qualified so to do. This Section of the Specifications requires that the following class[es] of work shall be listed in paragraph E under the conditions indicated herein.

	CLASS (ES) OF WORK	REFERENCE ARTICLE (S)
(Example)	Temperature Controls	2.25

[Note to Designer: Par, 1.01 A,, B & C are mandatory,, except as otherwise noted, Titles listed in this Sample Section Format represent categories of articles used in current Specification practice. Do not use titles inapplicable to the relevant Section,, but maintain those used in the sequence shown , The location and sequence of titles under their respective Parts are as follows:]

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

[Note to Designer: List all work items below]

(Example) 1.

(Example) 2.

(Example) 3.

B. Alternates: *[Note to Designer: List the number of Alternates and cross-reference to DIVISION I for description of work]*

C. Items to be Installed Only: Install the following items as furnished by the designated Sections:

[Example] 1. SECTION 08700 - HARDWARE

a. Finish Hardware

D. Items to be Furnished Only: Furnish the following items for installation by the designated Sections:

[Example] l. SECTION 07201 - ROOFING AND FLASHING

a. Roof Drains

E. Reference to Drawings: Work to be performed is shown on drawings numbered:

[Note to Designer : List the drawings on which the work of this Section is customarily shown, including additional drawings which may also indicate work of this Section.:
Example - *PI, P2, P3..... P9, A3, A6, S1, E12 etc.]*

F. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

[Example] SECTION 02660 - WATER SYSTEMS

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this section, including but not limited to the following:
   1. Water systems piping for potable water service and fire protection service from 10 feet outside the foundation wall to existing water mains in the street.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. SECTION 02200 - EARTHWORK
      a. Trench excavation and backfill requirements.
   2. SECTION 15300 - FIRE PROTECTION
      a. Fire protection systems inside the building to a point 10 feet outside the foundation wall.
   3. SECTION 15400 - PLUMBING
      a. Potable water distribution systems inside the building to a point 10 feet outside the foundation wall.

G. Related Work Specified Elsewhere

[Example] SECTION 02200 - EARTHWORK

1.3 RELATED WORK SPECIFIED ELSEWHERE
   A. Section 02100 - Site Preparation
   B. Section 02400 - Drainage
   C. Section 02500 - Granite Curbing
   D. Section 02505 - Precast Curbing

E. Section 02510 - Asphaltic Concrete paving
F. Section 02700 - Sanitary Sewer
G. Section 02713 - Exterior Water Distribution System
H. Section 02800 - Site Improvements

1.03 SUBMITTALS

A. Refer to SECTION 01300 - SUBMITTALS for submittal provisions and procedures. *[Note to Designer-: Include design data when applicable]*
B. Shop Drawings:

C. Samples:

D. Product Data:

E. Test Report:

F. Certificates

1.04 OUALITY ASSURANCE

1.05 REFERENCE STANDARDS

l.O6 DELIVERY STORAGE AND HANDLING

1.07 GUARANTEE/WARRANTY

A. *[Note to Designer: Include additional guarantee provisions if required by specified materials and / or systems l*

1.08 RECORD DRAWINGS

A. Refer to SECTION 01700 CONTRACT CLOSEOUT for Record Drawings.

1.9 UNIT PRICE WORK (See pages _____) *[Note to Designer: Insert this paragraph if unit price work is included]*

A. The following work is specified in companion Section _____ and shall be performed and paid for on a unit price basis, coordinated with Section 01025.

PART 2 - PRODUCTS

2.01 MATERIALS (specify three manufacturers or equal)

2.02 EQUIPMENT (specify three manufacturers or equal)

2.03 MIXES

2.04 FABRICATION

PART 3 - EXECUTION

3.Ol INSPECTION

3.02 PREPARATION

3.O3 INSTALLATION/APPLICATION/ERECTION

3.04 FIELD QUALITY CONTROL

3.05 ADJUSTING AND CLEANING

3.06 PROTECTION

3.O7 EXTRA STOCK/SPARE PARTS

3.O8 TESTING

3.O9 OPERATION AND MAINTENANCE DATA

END OF SECTION

[Note to Designer: Article and sub-level designations:]

PART 1 - GENERAL

1.01 ARTICLE

A. Paragraph

1. Subparagraph

a) Subparagraph

1) Subparagraph

This page intentionally left blank.

E NON-FILED SUB-BID PROCEDURE EXAMPLE

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

[Note to Designer: Titles listed in this Sample Section Format represent categories of articles used in current Specification practice, Do not use titles inappropriate to the relevant Section, but maintain those that are used in the sequence shown. The location and sequence of titles under their respective Parts are as follows:]

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

[Note to Designer: State specifically the work items include herein.]

[Example] 1. Chalkboards and Tack boards

[Example] 2 Lockers

B. Alternates: *[Note to Designer: List the number of Alternates and cross reference to DIVISION 1 for description of work.]*

C. Items to be Installed Only: furnished by the designated Sections:

[Example] 1. SECTION 08700 - HARDWARE
a. FINISH HARDWARE

D. Items to be Furnished Only: Furnish the following items for installation by the designated Sections:

[Example] 1. SECTION 07201 - ROOFING AND FLASHING:

a. Roof drains

E Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION 03300 - CAST IN PLACE CONCRETE

a. Pre-molded joint fillers occurring in concrete

1.03 SUBMITTALS

A. Refer to SECTION 01300 - SUBMITTALS for submittal provisions and procedures, *[Note to Designer: State requirements.]*

[Examples]

B. Shop Drawings:

C. Samples:

D. Product Data:

E. Test Reports:

F. Certificates:

1.04 QUALITY ASSURANCE

1.05 REFERENCE STANDARDS

1.06 DELIVERYO STORAGE AND HANDLING

1.07 GUARANTEE/WARRANTY

A. *[Note to Designer: Include additional guarantee provisions if required by specified materials and/or systems.]*

PART 2 - PRODUCTS

2.01 MATERIALS (specify three manufacturers or equal)

2.02 EQUIPMENT (specify three manufacturers or equal)

2.03 MIXES

2.04 FABRICATION

PART 3 - EXECUTION

3.01 INSPECTION

3.02 PREPARATION

3.03 INSTALLATION/APPLICATION/ERECTION

3.04 FIELD QUALITY CONTROL

3.05 ADJUSTING AND CLEANING

3.06 PROTECTION

3.07 EXTRA STOCK/SPARE PARTS

3.08 OPERATION AND MAINTENANCE DATA

3.09 TESTING

END OF SECTION

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F. DIVISION 1 - GENERAL REQUIREMENTS (EXAMPLES)

SECTION 01010

SUMMARY OF THE WORK

1.01 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

B. Equality of material, article, assembly or system other than those named or described in this Section shall be determined in accordance with the provisions of Article V of the CONTRACT AND GENERAL CONDITIONS.

[Note to Designer: The above paragraph B will appear only in this Section. Paragraph A shall be mandatory for all Sections of these specifications.]

1.02 REQUIREMENTS INCLUDED

A. Work under this Contract

B. Contract Method

C. Work Sequence

D. Contractor Use of Premises

E. User Agency Occupancy

F. User-Agency Furnished Products

G. Coordination

H. Field Engineering

I. Reference Standards

J. Pre-construction Conference

K. Project Meetings

L. Permits, inspection and testing required by Governing Authorities

M. Cutting, Coring and Patching, unless otherwise indicated

N. Debris Removal

[Note to Designer: add conditions here that have not been covered or differ from conditions that are specified in CONTRACT AND GENERAL CONDITIONS.]

1.03 WORK SEQUENCE

A. *[Note to Designer: Establish work sequence when required,]*

1.04 CONTRACTOR USE OF PREMISES

A. *[Note to Designer: Designer shall confer with DCAM for use of premises requirements.]*

1.05 USER AGENCY OCCUPANCY

A. The User Agency will not occupy the premises during [state period of construction and other conditions.] Cooperate with the User Agency to minimize conflict and to facilitate occupant's operations.

1.06 USER AGENCY-FURNISHED PRODUCTS

A. Products furnished and paid for by User Agency:

1. [_____]
2. [_____]

1.07 FIELD ENGINEERING

A. Provide professional field engineering services; establish grades, lines and levels, by use of recognized engineering survey practices.

B. Control datum for survey is that shown on Drawings, [_____.] Locate and protect control and reference points.

1.08 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as of the bid date, except when a specific date is specified.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at job site during progress of the specific work.

1.09 PRE-CONSTRUCTION CONFERENCE

A. In accordance with Article V of the CONTRACT AND GENERAL CONDITIONS, a pre-construction conference to review the work will be conducted by DCAM.

B. Representatives of the following shall be required to attend this conference:

1. DCAM

2. Designer

3. User Agency

4. General Contractor

5. All Subcontractors

6. Applicable Municipal Agencies

1.10 PROJECT MEETINGS

A. Project meetings shall be held on a weekly basis subject to the discretion of DCAM's Project Manager.

B. As a prerequisite for monthly payments, ordering schedules, shop drawing schedules, and coordination meeting schedules shall be prepared and maintained by the General Contractor and shall be revised and updated on a monthly basis, and a copy shall be submitted to DCAM's Project Manager and Designer.

C. In order to expedite construction progress on this project, the General Contractor shall order all materials immediately after the approval of shop drawings and shall obtain a fixed date of delivery to the project site for all materials ordered which shall not impede or otherwise interfere with construction progress.

D. Scheduling shall be discussed with all concerned parties, and methods shall be presented by the General Contractor which shall reflect construction completion not being deferred, at no additional expense to the Commonwealth.

E. Weekly project meetings shall be chaired by the Designer.

F. Minutes of project meetings shall be prepared by the Designer or by its designated representative and shall be distributed in a timely manner to all present with two copies to DCAM. (**Refer to Appendix B**)

[Note to Designer: Determine if construction coordination drawings are necessary and required, Notify DCAM if coordination drawings will be required.]

1.11 PERMITS, INSPECTION AND TESTING REOUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the General Contractor shall give the Designer and such Authority timely notice of its readiness so the Designer may observe such inspection and testing.

B. Prior to the start of construction, the General Contractor shall complete application to the applicable Building Code enforcement authority for a Building Permit. Such Permit shall be displayed in a conspicuous location at the project site.

END OF SECTION

SECTION 01025

UNIT PRICES

1.0l GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION l - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

*[Note to Designer: Refer to **Appendix H** for a sample unit price proposal sheet. If work under a specific section contains estimated quantities(for example Asbestos Abatement), and those quantities are paid for under the unit price section, care must be taken, to not confuse the quantities in the unit price section with those of the specific section]*.

1.02 REQUIREMENTS

A. Unit pricing shall be performed by the General Contractor and/or Filed Subcontractors as applicable.

B. Unit price work will be paid for in accordance with unit prices listed by the General Contractor, based on estimated quantities calculated by the Designer.

C. All unit prices shall include their pro-rata share of all costs for overhead, profit, bond, labor, materials, disposal and equipment to perform the work item complete, as identified,

D. Unit Price Proposal Sheets shall be included with sub-bid forms when applicable,

E The total amount of all unit price work shall be included in the amount to be entered in Item 1. work of the General Contractors, or Item 2 - work of Filed Subcontractors in the Form for General Bid.

F. Unit Prices shall provide for a variance in quantities of plus or minus 50 percent of those listed on the Unit Price Proposal Sheet.

[*Note to Designer: this percentage may vary depending on the knowledge of the existing conditions]*

G. No unit price work shall exceed the estimated quantity or upset cost unless a contract modification has been issued by DCAM.

H. A contract modification will be issued by DCAM to adjust the contract price resulting from the final quantities of the unit price work.

1.03 UNIT PRICES

A. The following unit prices as defined in the Project Documents are designated for items on the basis of quantities estimated by the Designer.

These unit prices will be used to add to or deduct from dollar amounts shown, depending on whether the actual amount is greater or lesser than the estimated amount.

List unit prices

END OF SECTION

SECTION 01030

ALTERNATES

1.01 GENERAL PROVISJTONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION I - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 REQUIREMENTS

[Note to Designer: Describe alternate work in a numerical sequence in order of *priority. Refer to* **Appendix I** *for a sample Alternate Proposal Sheet.* *Cross-reference all alternates* in *applicable Sections of* the *Specifications.]*

END OF SECTION

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SECTION 01300

SUBMITTALS

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 REQUIREMENTS

A. Shop Drawings, products data, samples and schedule of values.

1.03 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. General:

1. Review and submit, to the Designer, shop drawings, project data and samples required by Specification Sections.

B. Shop Drawings:

1. Original drawings shall be prepared by General Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work, showing fabrication, layout, setting or erection details.

a. Shop drawings shall be prepared by a qualified detailer.

b. Details shall be identified by reference to sheet and detail numbers indicated on Contract Drawings,

c. Maximum sheet size shall be 30-inch by 42-inch.

d. Reproductions for submittals shall be reproducible transparencies with the required number of prints specified herein.

C. Product Data:

1. Manufacturers' standard schematic drawings:

[Note to Designer: Delete information which is not applicable to project. Supplement standard information to provide additional information applicable to project.]

2. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data,

[Note to Designer: Clearly mark each copy to identify pertinent materials, products or models. indicate dimensions and clearances required. Indicate performance characteristics and capacities. Indicate wiring diagrams and controls]

D. Samples *[Note* to *Designer: Physical examples shall illustrate materials, equipment* or *workmanship, and shall establish standards by which work is judged. After review and approval, samples may be used in construction of project if not retained for comparison]*

1. Office samples of sufficient size and quantity shall clearly illustrate:

    a. Functional characteristics of product or material, with integrally related parts and attachment devices.

    b. Full range of manufacturer's standard or custom color samples.

2. Mock-ups:

    a. Erect at project site at location acceptable to Designer, each complete mock-up, including work of all trades required in finished work.

E. General Contractor's Responsibilities:

1. To coordinate each submittal with requirements of Contract Documents.

2. To be aware that the responsibility for errors and omissions in submittals is not relieved by the Designer's review and approval of submittals.

3. To notify the Designer in writing at time of submission, of deviations in submittals from requirements of Contract Documents or previous submissions.

4. To be aware that work that requires submittals shall not commence unless submittals with Designer's stamp and initials or signature indicating review and approval.

5. To distribute copies after Designer's review and approval.

F. Submission Requirements:

1. Make submittals promptly in accordance with approved schedules, and in such sequence as to cause no delay in the work.

2. Submit one reproducible transparency and four opaque prints of shop drawings, and number of copies of Product Data which the General Contractor requires for distribution, plus two copies which shall be retained by the Designer.

3. Submit number of samples specified in each Section of the Specifications.

4. Forward submittals with transmittal letter, in duplicate.

5. Submittals shall include:

a. Date and revision dates.
b. Project title and number
c. The names of:
    1) Designer
    2) General Contractor
    3) Subcontractor
    4) Supplier
    5) Manufacturer
    6) Separate detailer when pertinent.

d. Identification of product or material.
e. Relation to adjacent structure or materials.
f. Field dimensions, clearly identified as such,
g. Specification Section number.
h. Applicable standards, such as ASTM number
i. A blank space, five-inch by four-inch, for the Designer's stamp,
j. Identification of deviations from Contract Documents,
k. General Contractor's stamp, initialed or signed certifying review and approval of submittal.

G. Resubmission Requirements:

1. Shop Drawings:

    a. Revise drawings as required and resubmit as specified for previous submittal,

    b. Indicate on drawings any changes which may have been made other than those requested by the Designer,

2. Product Data and Samples: Submit new data and samples as required from previous submittal,

H. Distribution of Submittals After Review and Approval:

1. Distribute copies of shop drawings and product data that display the Designer's stamp to appropriate Subcontractors,

2. Distribute one approved copy of shop drawings and product data to the Resident Engineer and to the Project Manager.

3. Distribute Samples as directed by the Designer.

1.04 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Designer and DCAM, a Schedule of Values of the various portions of the work in sufficient detail to reflect various major components of each trade, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section in accordance with Article VII of the contract form. The schedule shall be prepared in such form as specified or as the Designer or DCAM may approve, and it shall include data to substantiate its

accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit, This schedule, including breakdown and values, requires the approval of the Designer and DCAM and shall be used only as a basis for the Contractor's request for payment.

1.05 HEALTH AND SAFETY PLAN

A The General Contractor shall prepare a Health and Safety Plan that addresses maintaining safe working conditions relative to chemical constituents in soil, sediment, groundwater and air.

B. The locations of surface and subsurface explorations are shown on the Drawings and copies of the analytical data are included in Appendix XX. Such data is offered in good faith solely for the purpose of placing the Contractor in receipt of all information available. The Contractor shall interpret such information according to his/her judgement and the Contractor acknowledges that he/she is not relying upon the same as accurately describing the location, type, and magnitude of the chemical constituents at the site. The Contractor further acknowledges that he/she assumes all risk contingent upon the nature of chemical conditions to be actually encountered by the Contractor in performing the work covered by the contract, even though actual conditions may result in the Contractor performing more or less work than originally anticipated.

C. The Contractor shall be cognizant of the minimum standards set forth in OSHA 29 CRE 1910.120. The Health and Safety Plan shall include, but not be limited to, the following:

1. Identification of the Contractor's Site Safety Officer.

2. Identification of ..(more to be added by J. O'Donnell)

D. The Contractor shall provide DCAM with written notice of the existence of said plan and of his/her communication of said plan to all relevant workers

END OF SECTION

SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 CONSTRUCTION SCHEDULE

A. Contractor shall prepare and submit for Architect and Asset Management's information, a Critical Path Method (CPM) progress schedule for the work of the project. Said schedule will be coordinated to include sequencing of the project work (if sequencing is required) In addition, a Project Scheduler will be required for this project. The specification section shall contain the following general requirements:

1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to Contractor
6. Adjustment of Critical Path Contract Completion Time
7. Computer Equipment Hardware, Software and Ancillary Supplies

B. Critical Path Method Scheduler

*[Note to Designer: Refer to **Appendix P** for the project size related criteria for type and complexity of schedule required]*

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SECTION 01400

QUALITY CONTROL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.02 REQUIREMENTS

A. General Quality Control,

B. Certified Welders.

1.03. RELATED REQUIREMENTS

A. Individual Sections throughout the Specifications contain requirements in quality control and testing,

B. Section [_____ - _____ .]

1. Testing, required for [_____ .]

1.04 QUALITY CONTROL, GENERAL

A. Maintain quality control as specified.

1.05 CERTIFIED WELDERS

A. Structural welds shall be made only by operators who have been qualified by tests, as prescribed in the "Standard Qualification Procedure " of the American Welders Society, to perform the type of work required.

B. Pipe welds shall be made only by operators who have been qualified by the National Certified Pipe Welding Bureau and each operator's qualification record shall be submitted to the Designer before any work is performed,

C. Shop welding shall be in accordance with the "Code for Welding in Building Construction."

END OF SECTION

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SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1. - GENERAL REQUIREMENTS which are hereby made a part of this Section of this Specifications.

1.02 REQUIREMENTS

A. Temporary Water

B. Weather Protection

C. Heating During Construction

D. Temporary Power

E. Hoisting Equipment and Machinery

F. Staging

G. Maintenance of Access

H. Roof Protection

I. Dust Control

J. Noise Control

K. Construction Aids

L. Enclosures

M. Construction Fence

N. Cleaning During Construction

O. Project Identification

P. Security

Q. Fencing

R. Field Offices

S. Telephone Services

T. Sanitary Facilities

1.03 TEMPORARY WATER

A. Water will be furnished by the Commonwealth up to the point indicated on the drawings for the permanent connection to the water supply system ,

B. Water shall be distributed by means of connections to the permanent service lines that are to be installed at the expense of the Plumbing Subcontractor,

C. Any temporary pipe lines and connections from the permanent service lines either outside or within the building, necessary for the use of the General Contractor and its Subcontractors shall be installed, protected and maintained at the expense of the General Contractor.

D. Use of the water may be discontinued by the Commonwealth if, in the opinion of DCAM, it is wastefully used.

E. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for its employees and those of its Subcontractors.
[Note to Designer: If the Commonwealth can not provide water for the project, the foregoing shall be appropriately revised add the General Contractor shall be required to pay the cost of all water.)

1.04 WEATHER PROTECTION

A. It is the intent of these Specifications to require that the General contractor shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March. in compliance with M.G,L. Chapter 149, Section 44G, These Specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible to protect in the judgment of the Designer. Included in the preceding category, without limitation, are such items as site work, excavation, pile driving, steel erection, erection of certain "exterior" wall panels, roofing, and similar operation:

B "WEATHER PROTECTION" shall mean the temporary protection of that work adversely affected by moisture, wind and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Designer and consistent with the approved construction schedule to permit the continuous progress of all work necessary to maintain an orderly and efficient sequence of construction operations. The General Contractor shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 40 degrees F, or higher depending on the nature of the work and the manufacturer’s recommendations, at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the Contractor.

C. Within 30 calendar days after its award of contract, the General Contractor shall submit in writing to the Designer for approval, three copies of its proposed methods for "Weather Protection."

D. Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices. Heating devices which may cause damage to finish surfaces shall not be used.

E. The General Contractor shall furnish and install one accurate Fahrenheit thermometer at each work area as designated by the Designer. However, one additional accurate Fahrenheit thermometer shall be provided for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

1.05 HEATING DURING CONSTRUCTION

A. Within 30 calendar days after the commencement of work under this Contract, the General Contractor shall submit in writing to the Designer for approval, three copies of its method and time schedule for heating during construction which shall concur with its general progress schedule hereto before submitted as required under Article V of the CONTRACT AND GENERAL CONDITIONS.

B. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a comparable resistance as the specified permanent construction, the General Contractor shall pay and provide heat therein of not less than 55 degrees F., nor more than 75 degrees F., which shall be continuously maintained in the enclosed area until the project is accepted.

C. The General Contractor shall furnish and install one accurate recording Fahrenheit thermometer at a place designated by the Designer, and one additional accurate thermometer for every 2,000 square feet of floor space, located as directed by the Designer in order to determine if the specified temperatures are maintained. The General Contractor or its authorized agent shall furnish daily to the Resident Engineer three copies of a signed statement of temperatures recorded every three hours.

D. The General Contractor, with the approval of the Designer and DCAM, may use the permanent heating system as specified for the project once it has been tested, flushed our and chemically treated, and is ready to operate. The General Contractor shall pay all energy costs for heating during construction and provide meters if required. The General Contractor and the HVAC and/or Electrical Subcontractor shall coordinate their work so that the permanent heating system for the building will be available and ready to provide heat as soon as the building is closed in. In case the contract includes more than one building, heating shall be provided for each building in accordance with the above provisions.

E. Operating labor shall be provided for continuous direct attendance, for frequent inspection of the system, emergency repairs, and keeping of temperature records. Continuous direct attendance shall mean direct attendance for twenty-four hours each day, seven days per week, Saturdays, Sundays and holidays included, throughout the progress of the work.

F. It shall be the sole responsibility of the General Contractor to arrange for and pay the HVAC and/or Electrical Contractor to operate and to put in first-class condition all portions of the

permanent heating system used for Heating During Construction, The Commonwealth will require the discharge of inexperienced or unsatisfactory operating labor.

G. If the system is electric heat, the foregoing requirements shall equally apply to all the comparable components thereof.

H. The installation and operation of heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection, Heating devices which may cause damage to finish surfaces shall not be used *[Note* to *Designer: If the Commonwealth* ***is*** *to furnish heat, instructions will be issued by DCAM* for *revising these Specifications]*.

1.06 TEMPORARY POWER

[Note to Designer: Determine if the Commonwealth [institution, in question] can provide electric energy for this project, or if it will have to be purchased from a utility company. Your determination would be based on power required for temporary services and the availability to provide sufficient power from *the institution if possible, or from the local utility, A letter from your office documenting your recommendation shall be forwarded to DCAM along with your B-4 submittal, Unless otherwise determined.. the General Contractor shall pay for all temporary power, This Section and the related references in Section 16201 shall be revised accordingly,* Special *attention shall be made to correlate the specific requirements set forth for temporary light and power between Section 16101 and, in this Section, to avoid conflicting statements,]*

A. The (Designer shall name the institution or utility company] will provide electrical energy required for temporary light and power. The Electrical Subcontractor is required under Section 16101, ELECTRICAL WORK, to provide temporary feeders of sufficient capacity from the local utility company, [Note to Designer: Insert proposed name of the utility company and characteristics of available power] or from the Institution power lines, at the point designated on the drawings, to provide for the electric light and power "requirements of building while under construction and until the permanent feeders have been installed and are in operation. It is not the intent of the above statement to relieve the General Contractor of the responsibility of payment for energy consumed during construction, 'But rather to afford him use of permanent feeders, etc. for electric distribution during construction, Payment for energy consumed during construction shall be the responsibility of the General Contractor until either Use and Occupancy or Final Acceptance has occurred.

B. The General Contractor shall pay for the cost of electric energy consumed by himself and by all of its Subcontractors *[Note to Designer: Omit if electric energy is to be furnished by the Commonwealth],* Any temporary wiring of a special nature, other than that specified in Section 16101, ELECTRICAL WORK, shall be paid for by the Subcontractor requiring it, such as:

1. Special circuits required by electric welders, elevators, lifts or other special equipment requiring high-ampage and/or special voltage service, etc.

2. Exterior lighting circuits for protection against vandalism, public warning lights and lights for advertising, etc.

C. The General Contractor and all Subcontractors, individually, shall furnish all extension cords, sockets, motors, and accessories required for their work. They shall also pay for all temporary wiring of construction offices and buildings used by them, except that the offices of the General Contractor and the Resident Engineer specified in the Contract Form.

D. All temporary wiring installed by the Electrical Subcontractor shall be removed after it has served its purpose. Use copper wire only.

E. Electric energy, if provided by the Commonwealth, may be discontinued if, in the opinion of DCAM, it is wastefully used. Then, DCAM will direct the General Contractor to pay for the furnishing and installing, by the Electrical Subcontractor, of a watt-hour demand meter and associated current transformers and if required, potential transformers to measure energy consumed from the Commonwealth. The General Contractor shall then pay for the energy consumed from the Commonwealth for the remainder of the construction period.

1.07 HOISTING EQUIPMENT AND MACHINERY

A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the General Contractor for the use of all Subcontractors' material and/or equipment delivered to the designated hoisting area except that which is specifically required to be provided by the Subcontractors themselves and is so stated in each appropriately related Section of the Specifications. All costs for hoisting operating services shall be borne by the General Contractor unless specifically excepted in the Contract Documents.

1.08 STAGING

A. All staging, exterior and interior, **required to be over eight feet in height**, shall be furnished and erected by the General Contractor and maintained in safe condition by him without charge to and for the use of all trades as needed by them for proper execution of their work, except where specified to the contrary in any filed sub-bid Section of the Specification. All staging below 8’-0” is the responsibility of the various Subcontractors.

1.09 MAINTENANCE OF ACCESS

A. The General Contractor shall provide and maintain for the duration of its contract, a means of access to, around and within the site, as indicated on the Contract Drawings, for vehicular traffic and authorized personnel. This means of access shall be construed to sustain the weight of equipment customarily engaged for use in construction projects of this type and magnitude. The General Contractor shall, without additional compensation from the Commonwealth, furnish labor and materials as may be required from time to time to maintain this means of access in an acceptable condition as determined by the Designer.

1.10 ROOF PROTECTION

A. During the construction period after the installation of the roofing system as specified under SECTION ROOFING AND FLASHING, the General Contractor shall take strict precautions against unnecessary traffic on the roof surface, and will not store any material on the roof.

B. After the satisfactory completion of all roofing and flashing work, the General Contractor shall be responsible for damages to the roof caused by work or materials of the other trades.

1.11 DUST CONTROL

A. The General Contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.

B. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the General Contractor.

C. The General Contractor shall take steps to prevent the introduction of pollutants and dust into the ventilation system during construction, and completely clean all ductwork and equipment prior to occupancy.

1.12 NOISE CONTROL

A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum.

B. Execute construction work by methods and by use of equipment which will reduce excess noise.

1. Equip air compressors with silencers, and power equipment with mufflers.

2. Manage vehicular traffic and scheduling to reduce noise.

1.13 CONSTRUCTION AIDS

A. Elevators designated by the Designer may be used during construction for the transportation of personnel and material as long as protective padding has been installed.

1.14 ENCLOSURES

A. Provide temporary, insulated, weather tight closures of openings in exterior surfaces for providing acceptable working conditions and protection for materials, allowing for heating during construction, and preventing entry of unauthorized persons. Provide doors with self-closing hardware and locks.

[Note to Designer: Carefully consider advantages and disadvantages of temporary roofing. Expand Roofing Section to specify details.]

B. Provide temporary roofing as specified in SECTION 07201 ROOFING AND FLASHING,

[Note to Designer: Use below only as needed to provide for User Agency occupancy.]

C. Provide temporary partitions and ceilings as required to separate work areas from User Agency's occupied areas, to prevent penetration of dust and moisture into User Agency's occupied areas, to prevent damage to existing areas and equipment. Construction shall be

framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; RSTC rating 35 in accordance with ASTM E901. (Flame Spread Rating of 25 in accordance with ASTM E84) Paint surfaces exposed to view in User Agency's occupied areas.

1.15 CLEANING DURING CONSTRUCTION

A. Unless otherwise specified under the various trade Sections of the Specifications, the General Contractor shall perform clean-up operations during construction as herein specified,

B. Control accumulation of waste materials and rubbish; periodically dispose of off-site, The General Contractor shall bear all costs, including fees resulting from such disposal.

C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

D. Maintain project in accordance with all local, Commonwealth of Massachusetts and Federal Regulatory Requirements,

E. Store volatile wastes in covered metal containers, and remove from premises.

F. Prevent accumulation of wastes which create hazardous conditions.

G. Provide adequate ventilation during use of volatile or noxious substances.

H. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

3. Do not dispose of wastes into streams or waterways.

I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

J. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.

K. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.

L. Provide on-site containers for collection of waste materials, debris, recycling and rubbish.

M. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas off the construction site.

N. Handle material in a controlled manner with as few handlings as possible, Do not drop or throw materials from heights.

0. Schedule cleaning operations so that dust and other contaminants resulting from cleaning will process will not damage surrounding surfaces.

1.16 PROJECT IDENTIFICATION

A. The General Contractor shall furnish and install one project sign of the dimensions shown. Sign shall be fabricated from one inch thick medium density overlaid exterior plywood laminated with waterproof glue. All edges of sign shall be banded with 1 inch by 1/2 inch pine banding. Sign shall be supported by two 4-inch by 4inch post supports set in 12 inch diameter concrete footings to a depth of four feet and so that sign is raised a minimum of four feet above grade. *[Note to Designer: Alternative methods of supports may by required by site conditions.]* All nails, nuts, bolts and other connecting hardware shall be galvanized.

B. Sign shall be lettered by a professional sign painter in accordance with the general layout indicated, but revised as required by the particular project from a drawing prepared by the Designer. Submit shop drawing indicating sign-construction and lettering.

C. At completion of the project, remove the sign and completely.

D. The Designer shall direct location of project sign.

E. Use graphics for typical sign as indicated in **Appendix M.**

1.17 SECURITY

[Note to Designer: Some secure facilities may require unique security measures and working conditions . Review these measures with the User Agency and include here.]

1.18 FENCING

A. A construction fence shall be provided along the entire perimeter of the contract limit of work lines as shown on Drawing ____.

B. The construction fence shall be 8'-0" high (or 6'-0" depending on the level of security required) galvanized steel chain link 2" mesh fabric or other approved construction, erected in a substantial manner, straight, plumb and true as approved by the Designer.

C. Gates shall be built into the fence at sizes and locations shown on drawing ____. Gates shall be well cross-braced and hung on heavy strap hinges with proper post and hook for double gates. Provide heavy hasps and padlocks for each gate. Provide a set of three keys for each lock to DCAM Project Manager and Resident Engineer to facilitate User Agency access.

D. Construction fence shall be erected to design parameters indicated in Section 020800, SITE IMPROVEMENTS.

E. Fencing shall be removed by the General Contractor at no cost to the Commonwealth at such time before final completeion or as the Designer directs. The General Contractor shall restore the existing and new site paving and landscaping after removing fence to an acceptable condition equal to the conditions existing prior to the start of the work.

1.19 FIELD OFFICES

A. The General Contractor shall provide a suitable field office on site for its own use. The location shall be at the discretion of DCAM and the User Agency.

B. Provide a separate conference room space with conference table and chairs to accommodate twelve (12) persons at one time.

C. In addition, the General Contractor shall provide an office in a separate trailer of not less than 475 square feet on the site for DCAM's Project Representative. Provide the office with partitions to separate it from public access, electric light, heat, air conditioning and window screens. The location shall be at the discretion of DCAM and the User Agency.

D. Equip the Project Representative's office with the following:

1. Two (2) lockable steel desks.
2. Two (2) swivel chairs.
3. Two (2) metal plan racks.
4. Two (2) reference tables 3 feet x 5 feet.'
5. Two (2) stools.
6. One (1) accurate Fahrenheit thermometer.
7. Refer to paragraph 1.20, TELEPHONE SERVICE for required phone equipment
8. Two (2) four-drawer metal file cabinets with locks.
9. Sample shelving: minimum 12 feet of 10" deep shelf.
10. Electric water cooler/refrigerator with disposable cups and water supply service.
11. One hard hat for each Project Representative and six visitor hats
12. One dry plain paper copy machine, with both a legal and standard size paper tray
13. One calculator with paper print-out

E. Computers: The General Contractor shall be required to furnish and install the following additional office equipment for the Division of Capital Asset Management (DCAM) Project Office which shall become the property of the Commonwealth. The contractor shall install and render fully functional all computer system equipment and software, as hereinafter defined and shall be responsible to maintain and/or replace all such items as may become lost, inoperative or damaged in the course of normal use. Maintenance service shall be provided for continuous service, or to provide for full restoration of usability within two normal working days of any reported malfunction thereof. Software installer shall consult with DCAM representative to verify installation configuration. Upon final completion of the project, all computer equipment hardware shall be professionally cleaned and delivered to DCAM main office.

[Note to Designer: These requirements will need to be updated on a regular basis, and adapted to the size of the project. In general these specifications will be appropriate for projects with a construction budget in excess of $1 million]

a. Basic Workstation Unit (1 unit required)

(1) Mini-tower Personal Computer consisting of:
(a) Pentium Processor III - 500 MHz, 512 cache (minimum)
(b) 320 MB of SDRAM (expandable to 384 MB)
(c) 10 GB hard drive
(d) 40x CD ROM drive
(e) One (1) 3.5” high density floppy disk drive
(f) At least 3 ISA, 2 PCI open slots
(g) At least 2 open bays
(h) 10/100 Ethernet network interface card (Windows NT compatible)
(i) Internal Data/Facsimile Modem with 56.6 Kbps
(j) SVGA 1280 x 1024, 256 color Video Adapter (8 MB)
(2) MONITOR:
(a) 17-inch or greater 1280 x 1024 resolution color monitor which meets MPR II (low electromagnetic radiation) standard.
(b) .28mm pitch, non-interlaced
(c) Meets EPA Energy Star conservation standard (implemented in hardware)
(3) KEYBOARD
101-key keyboard

b. Laser Printer with 32 MB RAM, 8 pages per minute
c. One (1) Ditto Max Professional Drive with 10 GB storage capacity
d. Microsoft mouse & pad (1 required)
f. System software (1 set required)
(1) MS DOS (latest version)
(2) Microsoft Windows (latest version)
(3) DOS Disk Caching Software
(4) Expanded Memory Management
g. Application Software (1 set required)
(1) Microsoft Office Professional for Windows (Latest version)
(2) Facsimile and data software for Windows.
(3) Service program from Internet access provider for the duration of the project.
(4) Primavera Project Planner P3 for Windows
(5) Primavera Expedition
(6) Training for three (3) persons, for all application software systems stated, by certified Primavera trainer.
(7) AutoCAD Architectural Desktop
h. Accessories: (1 set required)
(1) Dust covers for all equipment (CPU, video, keyboard, etc.)
(2) One (1) Surge protector
(3) 50 Formatted Diskettes with sleeves and labels.
(4) Six (6) Ditto Max 10 GB Cartridges.
(5) 5,000 sheets 8 ½” x 11”, 20 lb. white paper

F. Provide the Project Representative's office with the latest edition of the following documents:

1. Massachusetts State Building Code (two copies).
2. Means Construction Estimate Book including mechanical, electrical, and general building construction books (two copies).
3. NFPA 13, 13A, 14, 14A, 20, 70 and 101 Standards.
4. Complete set of Contract Documents, including Drawings and Specifications.

G. The General Contractor shall, on a daily basis, maintain the offices and conference space to be clean, orderly and air conditioned.

H. Refer to paragraph 1.21 for sanitary facilities requirements.

I. One digital camera capable of recording images on a 3 ½" disk.

1.20 TELEPHONE SERVICE

A. In addition to its own telephone requirements, the General Contractor shall provide and maintain separate direct line telephone service at the site in compliance with Article III, paragraph 8 of the Contract Form and the following additional requirements:

1. Provide at least one (1) coin box telephone for the use of the workmen engaged in the work. The location shall be at the discretion of DCAM and the User Agency.

2. Provide one (1) dedicated telephone line for the Resident Engineer and the following equipment

a. Cordless telephone with following features:
   1) Keypad in both base and remote units.
   2) Last number redial.
   3) Ten (10) number memory.
   4) Speakerphone in base unit.
   5) Carrying case for handset.
   6) Telephone paging units.

b. Automatic switching between facsimile and voice calls.
c. One Facsimile (Telefacsimile) machine.
d. Answering machine with following features:

   1) Variable announcement time, up to 30 minutes.
   2) Remote message retrieval.
   3) Message memo with time/date stamp.
   4) Digital counter.

3. Provide two (2) beepers and the related service for the length of the project.

B. Pay for the installation and removal of the temporary telephones and equipment and for all calls and fixed charges in connection therewith.

1.21 SANITARY FACILITIES

A. The General Contractor shall provide suitable toilet facilities for its staff, the Resident Engineer and the Designer, and additional facilities for the workmen on the job, including personnel of Sub-contractors and Filed Sub-contractors.

B. The Resident Engineer's trailer shall be equipped with toilet room containing a working chemical toilet. Trailer shall not be removed from site until at least one toilet room in new building is operational.

C. Provide chemical toilets where work is in progress and in quantity required by OSHA Code.

D. Chemical toilets and their maintenance shall meet requirements of state and local health regulations and ordinances and shall be subject to the approval the Resident Engineer and Designer.

E. Upon completion of new toilet facilities, the User Agency may designate a specific toilet area to be used for the General Contractor and Sub-contractors engaged in the Work. However, the General Contractor shall take responsibility for maintenance and cleaning of such areas and shall leave them in first class condition equal to the accepted conditions of toilet facilities not used for construction personnel.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

1.01. GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby make a part of this Section of the Specifications.

1.02 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

D. Do not use materials equipment removed from existing structures, except as specifically required, or allowed, by the Contract Documents.

1.03 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.04 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 01300 SUBMITTALS, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements.

1.05 HANDLING

A. Refer to CONTRACT AND GENERAL CONDITIONS and Specification Sections for requirements pertaining to transportation and handling of materials and equipment.

B. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturers' unopened containers or packaging, dry.

C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

l.06 PROTECTION OF LOOSE AND INSTALLED MATERIAL

A. Refer to CONTRACT AND GENERAL CONDITIONS and Specification Sections for requirements pertaining to storage and protection of materials and equipment.

B. Store products in accordance with manufacturers' instruction, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers' instructions.

C. For exterior storage of fabricated products, place on sloped supports above ground, Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

D. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

E. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged. and are maintained under required conditions.

F. General Contractor to protect all loose and installed material from damage until final acceptance of the building.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby make a part of this Section of the Specifications.

1.02 FINAL CLEANING

A. Unless otherwise specified under the various Sections of the Specifications, the General Contractor shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

C. Cleaning shall include all surfaces, interior and exterior in which the General Contractor has had access whether existing or new.

D. Refer to Sections of the Specifications for cleaning of specific products or work.

E. Use only those materials which will not create hazards to health or property and which will not damage surfaces.

F. Use only those cleaning materials and methods that are recommended by the manufacturer of surface material to be cleaned.

G. Employ experienced workmen, or professional cleaners, for final cleaning operations.

H. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

I. Wash and polish mirrors.

J. All new and/or existing glass and plastic surfaces throughout the building shall be thoroughly cleaned and washed by qualified window cleaners at the expense of the General Contractor just prior to acceptance of the Work.

K. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

L. Polish glossy surfaces to a clear shine.

M. Ventilating Systems: Clean permanent fi1ters and replace disposable filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

N. Prior to final completion, or User Agency Use and Occupancy, the General Contractor shall conduct an inspection of sight-exposed, interior and exterior surfaces, and all work areas, to verify that the entire work is clean.

0. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

1.03 GLASS

A. All broken or defective glass not required to be replaced under the provisions of SECTION 08801 - GLASS AND GLAZING, shall be replaced at the expense of the General Contractor.

1.04 RECORD DRAWINGS

A. Record Drawings shall consist of all the contract drawings.

B. The General Contractor and all Subcontractors shall be required to maintain one set of Record Drawings, as the work relates to their Sections of the Specifications, at the site.

C. The Record Drawings shall be stored and maintained in the General Contractor's field office apart from other documents used for construction. The Record Drawings shall be maintained in a clean, dry and legible condition and shall not be used for construction purposes.

D. Record drawings, as submitted by the General Contractor, shall be verified in the field by the Designer or its consultants. Verification by the Designer shall occur during the construction process and prior to the related work being completed and covered up.

E. The Record Drawings shall be available at all time for inspection by the Commonwealth's agents. All deficiencies noted shall be promptly corrected.

F. The following information shall be indicated on the Record Drawings:

1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the contract drawings.

2. The tolerance for the actual location of utilities and appurtenances within the building to be marked on the Record Drawings shall be plus or minus two (2) inches.

3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) ft. intervals and at all changes of direction.

4. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, clean-outs, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, taps and maintenance devices. The location of these internal utilities, appurtenances and devices shall be shown by offsets to the column grid lines on the drawings.

5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the Record Drawings.

G. At the end of each month and before payment for materials installed, the General Contractor, its Subcontractors, and agents of the Commonwealth shall review Record Drawings for purpose of payment. **IF THE CHANGES IN LOCATION OF ALL INSTALLED ELEMENTS ARE NOT SHOWN ON THE RECORD DRAWINGS AND VERIFIED IN THE FIELD, THEN THE MATERIAL SHALL NOT BE CONSIDERED AS INSTALLED AND PAYMENT WILL BE WITHHELD.**

H. Prior to the installation of all finish materials, a review of the Record Drawings shall be made to confirm that all changes have been recorded. All costs to investigate such conditions shall be borne by the applicable party as determined by the Designer.

I. At the completion of the contract, each Subcontractor shall Submit to the General Contractor a complete set of their respective Record Drawings indicating all changes. After checking the above drawings. The General Contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the Record Drawings to the Designer.

J. The Designer shall review the drawings and shall verify by letter to DCAM that the work is accurate. The Designer shall incorporate all changes on the original drawings. The Designer shall submit to DCAM, reproducible drawings on mylar and two electronic copies with two sets of prints to be used for the final inspection of the project. The electronic copies shall conform to the most recent version of the AIA CAD Layer Guidelines. Inaccuracies in Record Drawings, as determined by DCAM, may be grounds for postponement of the final inspection until such inaccuracies are corrected.

[*Designer's note: the type of electronic copy is subject to changes in technology and will be determined at the completion of the project*]

1.05 OPERATING AND MAINTENANCE REQUIREMENTS

A. At least *[Note to Designer: Fill in period of time]* prior to the time of turning over this contract to the User Agency for Use and Occupancy or final Acceptance, The General Contractor shall secure and deliver to The User Agency via the Designer, two complete, indexed files containing approved operating and maintenance manuals, shop drawings, and other data as follows:

1. Operating manuals and operating and maintenance instructions for all the systems.

2. Summary of the inventory of all major mechanical and electrical equipment provided in an electronic format which shall include: Equipment type, equipment description, manufacturer, model number, serial number and room location.

3. Catalogue data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.

4. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.

5. Names, addresses and telephone numbers of repair and service companies for each of the major systems installed under this contract.

B. Non-Availability of operating and maintenance manuals or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by DCAM until such time as the discrepancy has been corrected.

1.06 BUILDING SYSTEMS CHECK AND COMMISSIONING

A. The Designer is responsible for ensuring that all building systems are operating as designed including but not limited to: fire alarms and suppression, HVAC, lighting plumbing, and emergency power.

B. The Designers shall commission the building according to ASHRAE "Guideline for Commissioning of HVAC Systems".

1.07 CLOSEOUT REQUIREMENTS AND SUBMITTALS

A. Final Inspection:

1. The General Contractor shall submit written certification that:

a) Project has been inspected for compliance with Contract Documents and has satisfied the Department of Public Safety.

b) Equipment and systems have been tested in the presence of Designer and are operational and satisfactory.

c) Project is completed, and ready for final inspection.

2. Department of Public Safety Use and Occupancy Permit:

a) Arrange for a Department of Public Safety final inspection and secure the signed Certificate of Inspection for Use and Occupancy from the Department of Public Safety.

1.08 GUARANTEES AND WARRANTIES

A. Submit to the Designer all extended guarantees and warranties that have been specified in the various Sections of the Specifications.

G. DCAM REQUIREMENTS AND STANDARDS

1. Intent

a) The purpose of DCAM specification requirements and standards is to outline areas in which DCAM has requirements to be included in a section of work specified. If these requirements apply, then the following standards shall be incorporated into the contract specifications, verbatim, when applicable. The requirements and standards of all Specification Divisions, except Division 1, shall utilize the CSI Three Part Specification System.

b) The following requirements and standards are supplemented by those supplied in **Appendix L**, which specifically address issues of material selection, efficiency, conservation, and indoor air quality.

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2. Site Work

Requirements

a) The methods and procedure for compaction operations shall be set forth in the Specifications in specific detail.

b) The words "satisfactory disposal" of all materials to be removed for the proper execution of the work shall be defined in the Specifications.

c) Where a site development contract precedes a building project on the same site, the engineering and surveying work shall be included in the site contract with the following additional requirements:

(1) The General Contractor shall be responsible for, and pay for costs incurred and shall obtain a final topographic and location survey immediately after completion of the Site Work.

(2) The work shall be performed in accordance with the Professional Practice of Surveying and Mapping within Civil Engineering as published by the American Congress on Surveying and Mapping, by a Land Surveyor or a Civil Engineer registered in the Commonwealth of Massachusetts.

(3) The Designer shall include a complete description of the survey work to be accomplished by the General Contractor.

(4) Record Drawings for the Site Work shall be maintained during construction by a Registered Surveyor or Engineer in the employ of the General Contractor, Drawings shall be maintained and finalized as required in DIVISION 1, General Requirements.

(5) At the completion of the contract, the Registered Surveyor or Engineer shall submit to the General Contractor for processing to DCAM, a complete reproducible set of Record Drawings showing all conditions, together with his/her registration seal and signature.

(6) The Designer shall include handicapped parking, signage and curb cuts in this section or other related sections to meet the requirements for an “accessible path of travel” to all entrances, as required to comply with the Regulations of the Massachusetts Architectural Access Board.

d) Landfill closures: landfill closures shall be designed in compliance with DEP requirements. **(see Appendix XX)**

e) Underground storage tank installation and removal: Installation and removal of underground storage tanks shall follow DEP requirements **(see Appendix XX)**

f) When the project requires soil or rock excavation, the following requirements shall be included:

(1) The Contractor shall be responsible for the Erosion Control plan and Local Conservation's Order of Conditions.

Standards

[Note to Designer: Fill in extra payment costs for additional excavation, rock excavation and additional gravel borrow after approval from DCAM.]

a) Additional Excavation

(1) Excavation, other than excavation of rock as herein defined, below the bottom grades for work indicated, if ordered to be removed by the Designer with the prior written approval of DCAM**,** because of "Differing Site Conditions", will be paid for, in addition to the lump sum contract price at the following rates:

(a) For the first 8 feet below bottom grade $ per cubic yard, measured in place between payment lines, 18 inches outside the vertical concrete lines, or for a width equal to the inside diameter of pipe or conduit, plus 18 inches on each side, as defined by the construction drawings or duly authorized modification thereto.

(b) For depths of more than 8 feet below bottom grade, compensation will be make in accordance with provisions of the CONTRACT AND GENERAL CONDITIONS.

(c) The payment under the above paragraphs shall cover all costs relating to such extra excavation, including sheeting, shoring, pumping, disposal of surplus or unsuitable material, filling, back filling, compacting overhead, superintendence, profit, and all related costs as prescribed under the CONTRACT AND GENERAL CONDITIONS.

b) Rock Excavation

(1) Excavation of rock in excess of one cubic yard, if ordered in writing by the Designer with the prior written approval of DCAM, will be paid for in addition to the lump sum contract price at the rate of cost per cubic yard in open cut, and cost per cubic yard in trenches, both measured in place anywhere within the contract limits as defined on the drawings or any duly authorized modifications thereto. except in areas where blasting is not allowed, in which cases payment shall be in accordance with the CONTRACT AND GENERAL CONDITIONS. The payment shall cover all costs relating to such ledge excavation, including blasting, removal and satisfactory disposal of the excavated material, overhead, superintendence, profit, and all related costs as prescribed under the CONTRACT AND GENERAL CONDITIONS.

(2) Measurement and Payment of rock excavation will be made for:

(a) Foundations within the limits of the concrete lines as defined by the construction drawings or duly authorized modifications thereto, plus 10 inches outside the vertical concrete lines.

(b) Pipes to a depth of 6 inches below the bottom of the bell and for a width equal to the inside diameter of the pipe or conduit plus 18 inches on each side.

(c) Any unforeseen rock excavation encountered and required to be removed for the construction of work defined on the drawings and required under this contract, as being within the contract limits shall be paid for by measuring said excavation in its original position to the limit of the clearly defined vertical construction lines and the depth required by the new construction.

[Note to the Designer: When blasting is not allowed, the rock removed shall be paid for under the provisions of the CONTRACT AND GENERAL CONDITIONS, The method of removal shall have prior written approval of DCAM before proceeding.]

(3) Blasting operations, if permitted, shall conform to the regulations of the Massachusetts Department of the Public Safety concerning storage, handling and use of explosives as set forth in CMR regulations, latest edition.

c) Additional Gravel Borrow

(1) The General Contractor shall provide additional gravel borrow when such is not available on the site for any unanticipated filling or back filling requirements, if ordered in writing by the Designer with the prior approval of DCAM,

(2) Payment for additional gravel borrow will be made in addition in the lump sum contract price at the rate of cost per cubic yard, measured in place, which shall include all costs relating to the furnishing, installing, compacting, overhead, superintendence and profit.

d) Definitions

(1) The word "rock" whenever used as the name of the excavated material shall mean, sound bedrock, ledge, boulders, concrete and masonry structures or portions thereof, required to be removed from the excavation. The surface of sound bedrock shall be taken below the level of any rock disintegrated or fractured to such an extent, to be removable by hand tools, power equipment or other mechanical means.

(2) The word "trench" shall mean excavations having vertical sides whose depths exceed their width, for pipes such as drain, sewer, water and gas pipes, electric and steam conduits and foundations.

(3) Compaction shall mean the tamping and rolling of all fill and backfill placed in uniform horizontal layers not exceeding six inches in thickness. Water shall be added in such amounts as necessary to obtain required compaction to a density of not less than 95 percent as determined by ASTM Designation D-698, Method C.

(4) Gravel borrow shall consist of inert material that is hard durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials, uniformly graded and containing no stone having any dimension greater than four (4) inches. Gradation shall be determined in accordance with ASTM Designation D422.

e) Utility work by local utility company.

3. Concrete

Requirements

a) All DCAM projects that include concrete shall conform to the requirements of the latest edition of American Concrete Institute ACI 301 "Specifications for Structural Concrete for Buildings". These Specifications shall be used essentially in their entirety by referral in the project Specifications.

b) The Designer shall review the mandatory and supplemental requirements listed in ACI 301, items not listed in these Specifications will be assumed to be inapplicable to the project .

c) As a requirement of the Specifications, two (2) copies of the latest revision of ACI 301 shall be furnished by the General Contractor for use in the field by the General Contractor and the Resident Engineer.

d) Floors, walls and decks of swimming pools and the roof above shall have reinforcement steel epoxy coated.

e) No insulating concrete fill shall be used on roof decks.

f) Metal reinforcement for exterior pre-cast concrete panels, and floors and ramps of parking garages shall be hot dipped galvanized steel after fabrication in accordance with ASTM A123 and shall be marked with a stamp that indicated the ASTM A123 and shall be marked with a stamp that indicates the ASTM number of ounces of zinc per square foot of steel or epoxy coated. After galvanizing, the bars shall be dipped in a 0.28 percent chromic acid solution. A notarized Certificate of Compliance shall be required from the galvanizer for all of the above.

g) All exposed embedded items in exterior concrete or parking garage floors or ramps shall be galvanized if fabricated from ferrous metal as in subparagraph f), above or epoxy coated.

h) The Specifications shall include a provision requiring that the General Contractor shall submit its proposed methods for curing of concrete to the Designer for approval not less than 10 days prior to placement of any concrete.

i) The Specifications shall direct the General Contractor to maintain an accurate daily record of the locations in which concrete is placed and shall furnish a certified copy of this record to the Designer.

j) The Contract Specifications shall also include the Specification Standard paragraph entitled "Additional Concrete due to Unanticipated Soil conditions" for all projects involving a lump sum proposal.

k). All underground chambers for exterior electrical work shall be constructed of cast-in-place concrete or one-piece precast concrete chambers.

Standards

[Note to Designer: Fill in additional payment costs for concrete., reinforcement and form work after approval from DCAM.]

a) Additional Concrete due to Unanticipated Soil Conditions.

(1) Additional concrete footings or foundation walls or piers if ordered in writing by the Designer with the prior approval of DCAM because of unanticipated soil conditions shall be paid in accordance with the following schedule:

Concrete: $_____ per cubic yard--measured in place.

Reinforcement: $_____ per ton--measured in place.

Form work: $_____ per sq. ft. contact area--measured in place.

(2) The above process shall cover all costs relating to the furnishing and placing of such concrete, including sheeting, shoring, pumping, bracing, stripping, overhead, superintendence and profit. The limit of measurement for payment shall be taken as the additional depth of the foundation walls or piers. The original footing size shall remain the same unless the additional depth necessitates an increase in size as determined by Designer. No amount other than that herein specified will be paid by the Commonwealth for concrete herein specified.

4. Masonry

Requirements

a) The Masonry Subcontractor shall build sample panels each approximately 4 feet by 6 feet at project site when directed by the Designer showing bond, jointing and mortar color and allowable texture variation of the face brick, structural facing tile or concrete masonry units include wall reinforcing, flashing, and backup in each sample.

b) Walls of cavity construction may be used with a minimum of 1 1/2 inch clear cavity air space between face brick and back-up, and 3/8 inch parging on face of back-up masonry or suitable damp-proofing material. If metal stud back-up is employed, waterproof sheathing and a membrane facing should be provided. All cavity walls should have unobstructed weeps at the base of the cavity. Brick shelves below grade are not recommended, but will be considered.

c) The Masonry Subcontractor shall install all access panels, lintels, dovetail anchors, or other accessories that are furnished under other Sections but are to be built into masonry.

d) Pre-faced concrete masonry units, when specified, shall meet the requirements of ASTM C744.

e) Specify actual brick sizes for each project.

f) Specify full grouting of all hollow metal door frames adjoining masonry.

g) At completion of masonry work, all exposed masonry walls shall be thoroughly cleaned by approved methods.

h) Masonry accessories when fabricated from ferrous metal shall be galvanized as follows:

(1) Reinforcement for exterior walls- Hot-dip galvanize in compliance with ASTM A153, Class B-2.

(2) Reinforcement for interior walls- Galvanize wire ASTM A-116.

(3) Accessories embedded in exterior walls- Hot-dip galvanize after fabrication in compliance with ASTM A153.

i) For exterior wall installations, include relieving angles at locations determined by the Designer. When angles are fabricated from ferrous metal, they shall be hot-dip galvanized after fabrication in accordance with ASTM A386 or A123 as applicable. All hot-dip galvanized items-shall be stamped to indicate the ASTM number and the ounces of zinc per square foot of surface. A notarized certificate of compliance shall be required from the galvanizer.

j) Specify Portland-cement-lime mortar with hydrated lime and Portland-cement conforming to ASTM Specification C-150 or C-175. The Masonry Subcontractor shall use a mix that conforms to ASTM C270, Table II, Mortar Proportioned by Volume, minimum compressive strength 750 PSI(Type N). Greater Strength mortars when required shall be

specified as recommended by the Brick Institute of America. Designer shall indicate the desired mix in the Specifications. Mortar shall be subject to testing by an independent testing laboratory.

k) Masonry requirements, other than those indicated herein, shall follow the recommendations of the Brick Institute of America.

1) The Masonry Subcontractor shall furnish, install and maintain in safe and adequate conditions all staging and scaffolding that are necessary for the proper execution of the work in this Section. The requirements of Section 01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS in relation to staging, do not apply to this Section of the Specifications.

m) Copings and window sills shall have at least 1 inch overhang. Brick window sills shall be avoided.

n) Specifications shall instruct Masonry Subcontractor to submit samples of each type of block proposed for the project for the Designer's approval. More than one submittal may be required.

o) Brick pavers less than 1 1/2 inches thick are specified in Section 09301 TILE. Pavers without mortar or bituminous adhesive are specified in Section 02500 PAVING AND SURFACING.

p) Install flexible wall flashing when furnished in Section 07201 ROOFING AND FLASHING.

q) Unit masonry flooring shall be furnished and installed in Section 09630, UNIT MASONRY FLOORING.

r) A separate filed sub-bid may be required for projects that involve large quantities of natural or manufactured stone in Section 04401 STONE.

s) Face brick and paving brick shall be specified with at least 3 manufacturers for each type of brick. One of the 3 specified manufacturers for each type of brick shall be from Massachusetts.

t) Specify the sealing of backs of exterior wall stone.

u) For stone on exterior wall installations, include relieving angles at locations determined by the Design Engineer. When angles are fabricated from ferrous metal they shall be hot-dip galvanized after fabrication in accordance with ASTM A386 or A123 as applicable. All hot-dipped galvanized items shall be inspected for compliance with ASTM requirements and shall be stamped to indicate the ASTM number and the ounces of zinc per square foot of surface. A notarized certificate of compliance shall be required from the galvanizer.

Standards

a) **Brick and Block Work**.

(1) Face brick shall be solid, hard burned, water struck, sand molded, or wire cut brick with water absorption of not more than 10 percent for an average of 5 bricks when tested by the five hour boiling test in accordance with ASTM Designations C67 and which shall conform to the requirements of ASTM C216, Grade SW, Type FBS for extruded and Type FBA for molded products.

(2) Exterior paving brick shall conform to ASTM C902, Grade SX, Type 1, with water absorption of not more than 5 percent with the five-hour boil. Laminated brick will not be accepted. Paving brick when bonded with mortar shall be waxed with 150 degrees F wax. Final cleaning shall be by steam, or other methods if approved by the Designer. If area is subject to various chemicals, the brick shall pass ASTM text C279, type L.

(3) Concrete masonry units used for back-up shall meet the requirements of ASTM C90, "Hollow Load-Bearing Concrete Masonry Units" or of ASTM C145 "Solid Load-Bearing Concrete Masonry Units.

(4) All bricks shall have a low rate of suction at the time they are placed in the work; to secure this low rate of suction, the brick shall be thoroughly wetted and not allowed to dry out. The suction of the brick shall be so reduced that specimens of brick, taken from the scaffold, shall not gain more than 0.7 of an ounce (20 grams) in weight when placed in 1/8 to 1/4 inch of water for one minute.

(5) All head joints and bed joints in both face brick and back-up work shall be completely filled with mortar.

(6) All head joints and bed joints on brick and masonry units shall be tooled to give a concave finish. This shall be done with a round tool slightly larger than the joints, before the mortar hardens, and with sufficient force to press the mortar tight against the unit on both sides of the joint. All mortar smears shall be removed. A struck flush joint may be used in certain instances.

(7) All masonry work shall be adequately tied and reinforced.

(8) All newly laid brickwork shall be satisfactorily covered at night and during showers and periods of work stoppages.

(9) Provide weep holes in masonry in accordance with the Brick Institute of America.

b) Structural facing tile shall be of select quality and meet the specifications and standards of the Facing Tile Institute. All cutting should be done with power saws. Facing tile sizes shall be 6T and 4D series.

c) Cold weather requirements.

(1) No brick or block masonry shall be laid when the outside air temperature is below 40 degrees F. except where weather protection materials have been furnished and installed by the General Contractor in accordance with Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

(2) All masonry materials shall be heated to 40 degrees F immediately before installation.

(3) No anti-freeze or accelerator admixtures will be allowed in the mortar.

(4) No frozen work shall be built upon, and any such work shall be removed.

(5) All completed masonry sections shall be properly covered and cured at 40 degrees F. temperature for a minimum of 24 hours following placement of grout.

5. Metals

Requirements

a) The Miscellaneous and Ornamental Iron Section shall include, but not be limited to, the following items: steel stairs, handrails and railings, ornamental metal, elevator ladders, ladders, ships ladders, balconies, catwalks, ornamental fences and gates other than chain link, fire escapes, decorative grilles and screens, and any other non-standard metal items requiring custom fabrication and installation.

b) Iron and steel products shall conform to applicable ASTM test requirements.

c) All Miscellaneous and Ornamental Iron to be exposed to the weather or high humidity areas and fabricated of corrosive iron or steel shall be hot-dip galvanized after fabrication whenever possible in accordance with ASTM A386 or A123 as applicable. All hot-dip galvanized steel shall be inspected for compliance with ASTM requirements and shall be stamped to indicate the ASTM number and the ounces of zinc per square foot of surface. A notarized certificate of compliance shall be required from the galvanizer.

d) Galvanized items to receive additional finishes shall be additionally treated by applying a passivating process equal to Bonderizing, Granodizing or Duacanizing.

e) All iron and steel, not to be galvanized, shall require a shop coat of paint prior to shipping. The location of walkways, catwalks, ladders, handrails and stairways to provide access to all valves, water columns, drum manholes and machinery parts should be coordinated between the Designer and the HVAC Consultant. The width of walkways and catwalks shall be not less than 30 inches. At points where pipes or accessories encroach upon walkways and catwalks, a minimum clearance of 30 inches shall be provided.

f) A minimum clear headroom of 84 inches shall be provided over all walkways, catwalks and stairways.

g) Walkways, catwalks and stairways shall be provided with hand railings 42 inches in height, consisting of a top rail and an intermediate rail supported by posts. The rails and posts may be pipes or angles.

h) The supporting structures for walkways, catwalks and stairways shall be bolted or riveted. The posts for hand railings shall be bolted or riveted to their supporting structures, but welding will be permitted for attaching the railings to the posts.

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6. Wood and Plastics

Requirements

a) Grading Rules Specifications.

(1) Softwood lumber shall conform to American Lumber Standards for softwood lumber.

(2) Hardwood shall conform to the standard rules of the National Hardwood Lumber Associates.

(3) Softwood Plywood shall conform to U.S. products Standard P.S. 1 by American Plywood Assn.

(4) Hardwood Plywood shall conform to U.S. Commercial Standards CS 35 by the Hardwood Plywood institute, latest edition.

(5) Lumber and Plywood shall be identified by the official grade mark, except where grade mark will interfere with the natural finish. In such cases, the material shall be accompanied by a certificate of inspection issued by a lumber grading and inspection agency.

(6) Structural glued laminated timber shall conform to the American Institute of Timber Construction ANSI/AITC A 190.1.

(7) All architectural woodwork shall comply with a selected grade (premium, custom, economy) of the Quality Standards of the Architectural Woodwork Institute, latest edition.

b) All lumber used for blocking, nailing cleats and other wood set in exterior walls or roofs or in contact with damp concrete, shall be impregnated, under pressure with a wood preservative or water borne type, chromated zinc chloride, chetwo monite, celure, Groensalt or Erdalith, Tanalith (Wolman Salt) or equal. All treated wood shall be re-dried before installation and all field cuts shall be brush treated with the preservative materials. Minimum retention shall be 0.30 pounds of preservative per cubic foot of wood.

c) Exterior architectural woodwork shall be treated by not less than a three minute dip in a 5 percent solution of pentachlorophenol with water repellent added.

d) All pitched roofs shall be designed to provide for a minimum 6 inch overhang or shall have gutters and down spouts. All wooden entrances under pitched roofs shall be protected with a water diversion system and snow guards if required.

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7. Thermal and Moisture Protection

Requirements

a) All packaged materials specified shall be delivered to the site in approved manufacturers' sealed containers bearing manufacturers' name, material identification and accompanied by manufacturers' written application instructions.

b) All surfaces adjacent to the work shall be protected from damage.

c) Waterproofing

(1) All surfaces subject to hydrostatic water pressure shall be waterproofed.

(2) Any membrane system that may be subjected to damage shall be properly protected.

(3) Require that the Waterproofing Subcontractor guarantee in writing to make prompt repairs at its own expense to all metallic waterproofing work that develops leakage within five (5) years from the date of acceptance.

d) Dampproofing

(1) Specify dampproofing for exterior surfaces of all foundation walls enclosing usable interior areas and pits below exterior finish grade.

(2) Exterior concrete walls above grade to receive rigid insulation shall be dampproofed on the interior face.

(3) Specify a protective mastic coating trowelled over all structural steel encased in exterior masonry tile or stone.

e) Caulking/Sealants

(1) Clearly distinguish between all areas to receive either caulking or sealants on drawings as well as specifications.

(2) Specify proper joint preparation.

(3) Oil base caulking will not be permitted on exterior surfaces.

(4) Interior caulking shall be water based and with a low VOC if possible.

f) Roofing

(1) General Design requirements shall follow the latest approved practice in the industry as outlined in the latest addition of the "NRCA Roofing & Waterproofing Manual", Published by the National Roofing Contractors Association.

(2) The Roofing Subcontractor shall be required to furnish a written two year guarantee for both built up, modified bitumen, single-ply, liquid applied elastomeric or metal

roofing systems. The roofing system manufacturer shall issue a concurrent fifteen year, no dollar limit, total roofing system guarantee. The guarantee period shall commence at Final Acceptance or Use and Occupancy whichever occurs first.

(3) Roofing or structural roof systems on new buildings shall be designed to provide for a minimum 1/4 inch per foot pitch to roof drains, shall be properly insulated, shall have no organic materials and shall be properly flashed and counter-flashed. Insulating concrete fill shall not be used on roofs.

(4) The Roofing Subcontractor shall be responsible for closely inspecting the roof surface prior to installing any materials. If there are deficiencies in the roof surface, the Roofing Subcontractor shall inform the General Contractor, Designer and DCAM of such deficiencies. in writing. Commencement of roof material installation shall mean acceptance of the roof surface by the Roofing Subcontractor.

(5) Roofing work on any given area of roof shall be made completely watertight and weatherproof in the same working day.

(6) The Roofing Subcontractor shall be required to provide curbs and adequate supports for roof mounted equipment unless otherwise indicated and to provide walkways to major roof mounted equipment.

[Designer note: duct work located on the roof is not preferred. If this occurs coordinate with the roofing section of the Specifications]

(7) All roofing materials shall be in the Manufacturers' original unopened containers, rolls with labels intact, legible and including fire resistance classifications. If roofing materials arrive in tanker trucks, a copy of the delivery slip showing content of materials shall be furnished. Materials shall be stored on clean raised platforms with weather protective covering when stored outside. All wet or damaged materials shall be immediately removed from the project site.

g) Spray Applied Fireproofing

(1) Generic Description: Cementitious fireproofing with out mineral fibers.

(2) Interior Application: Gypsum based cementitious fireproofing (bond strength 200 psf)

(3) Exterior Application: Medium density, cement based fireproofing (bond strength 1,000 psf)

(4) Tinted Sealer: Provide an encapsulant material (CBUI) in compliance with ASTM E-119 tinted to provide visual assurance of application in concealed locations. Provide a portland cement based latex modified veneer plaster in compliance with ASTM- E 605, C569, C354 and D 2240 in high traffic areas.

8. Doors and Windows

Requirements

a) Doors

(1) Metal doors shall be of 18 gauge material for interior and 16 gauge material for exterior doorways. Doors shall be flush type, 1 3/4 inches thick with a maximum height of 7 ft. - 0 inches.

(2) Metal frame shall be 16 gauge material for interior and 14 gauge material for exterior doorways. All corners shall be mitered and welded.

(3) Hollow metal doors and frames where required to have fire resistive ratings shall be labeled and meet the detailed requirements of Underwriters' Laboratories, Inc.

(4) All exterior hollow metal doors and frames shall be hot-dip galvanized (ASTM A526) with a coating weight of G60. Following galvanizing and prior to finishing, a passivating process equal to Bonderizing shall be performed. After Bonderizing, apply a shop-coat of rust inhibiter primer.

(5) All exterior openings shall be weather stripped.

(6) All metal doors composed of styles and rails shall be of heavy duty type.

(7) If frames are installed in masonry walls cross reference to Masonry Section, that full grouting of hollow metal door frames is required.

(8) All non-labeled wooden doors shall be solid core flush type, 1-3/4 inches thick with a maximum height of 7 ft. - 0 in., unless otherwise authorized.

(9) All door sizes, placement and hardware shall conform to the latest Rule and Regulations promulgated by the Massachusetts Architectural Access Board.

b) Metal Windows

(1) The Metal Window Section shall include steel windows, aluminum windows, detention windows and screens, window walls, curtain walls and entrance and sidelight systems if a part of a correlated window system. Stainless steel, bronze, PVC, nylon and other special windows or finishes may be used only if approved by DCAM.

(2) Windows that require cleaning by standing or sitting on the sill from the outside having sills more than ten feet above the ground level or roof of an adjoining structure, and where the sill of any window to be cleaned from the inside is more than ten feet above the floor shall be designed to provide anchors conforming to the Rules and Regulations of the Department of Labor and Industries, Division of Industrial Safety.

(3) The manufacturing and performance requirements for aluminum windows shall be in accordance with ANSI/AAMA "Voluntary Life Cycle Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors (AAMA 910-93)." All

types of aluminum windows shall meet the applicable Primary Performance Requirements of this standard.

(4) The minimum requirements for the manufacture of steel windows, in each of the types listed above, shall be in accordance with the "Steel Window Institute" Specifications, for heavy intermediate windows.

(5) When exterior steel windows and frames are specified, they shall be hot-dipped galvanized after fabrication in accordance with ASTM 386. The galvanized steel shall then be inspected for compliance with ASTM requirements and shall be stamped to indicate the ASTM number and the ounces of zinc per square foot of steel. A notarized certificate of compliance shall be required from the galvanizer. Following galvanizing, a passivating process equal to Bonderizing, Granodizing, or Duncanizing shall be performed. This treatment shall be followed by a shop application of a baked-on prime coat of paint.

(6) Curtain walls should be field tested to comply with ASTM E-283, ASTM E-331, ASTM E-330-79, ASTM 1502.7 and ASTM 1503.1.

Standards

*[Note to Designer: Refer to **Appendix L** for the **FINISH HARDWARE section which is** illustrated as a basic standard. The contents have been proven successful in the past. Alternate contents in the CSI format may be utilized with the approval of DCAM.]*

9. Glass and Glazing

Requirements

a) The Glass and Glazing Section shall include, but not be limited to glass, plastic glazing, including installation materials and aluminum entrance systems if not part of a correlated window system in SECTION 08501 METAL WINDOWS.

b) Type and thickness of glass shall meet the requirements of Federal Specification DD-G-451.

c) Your attention is directed to Chapter 143 Sections 3T, 3U and 3V of the Mass. General Laws, as amended. Safety glazing material shall be specified for installation in hazardous locations. "Safety glazing material" ' shall mean tempered glass, laminated glass, wire glass or rigid plastic which meets test requirements of the Department of Public Safety and adheres to the ANSI Standard Z97., (Safety Glazing Code).

d) "Hazardous locations", mean those installations, glazed or to be glazed in commercial or public buildings, known as framed or unframed glass entrance doors including fixed glazed panels adjacent to entrance and exit doors which because of their locations present a barrier in the normal part. traveled by persons going into or out of such buildings.

e) Each light of safety glazing material shall be permanently labeled and shall be legible. The 1abel shall identify the labeler, the nominal thickness, the type of safety glazing material and the fact that said material meets the test requirements indicated above.

f) Specifications for aluminum doors-and frames shall comply with the recommendations of the "Architectural Aluminum Manufacturers Association (A.A.M.A.)".

g) All insulating glass shall be factory-sealed units having a 10-year written guarantee and conforming to the requirements of "Insulating Glass Certification Council" IGCC - CBA.

h) Tinting and low E-glass should be considered in a life cycle analysis.

i) Design the glazing system so that building movements due to wind loads and thermal effects are not transferred to the glass.

j) The replacement of glass broken after the installation of glass as specified in this Section and the cleaning of all glass is not included in this Section, but is specified in SECTION 01700 CONTRACT CLOSEOUT.

k) Glass panels from floor to ceiling shall be protected by some type of device or rail to prevent people from walking through or into the glass.

l) Hold open arm type door closers on exterior doors will not be allowed.

m) All aluminum doors composed of stiles and rails shall be of wide-stile design.

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10. Finishes

Requirements

a) The Lathing and Plastering Section shall include, but not be limited to, the following items: plaster, Keene cement plaster, furring, metal and gypsum lathing, scratch coat and lathing for ceramic tile walls, metal stud systems, plaster ceiling suspension systems, fireproofing, and all accessories.

(1) Waterproof Portland Cement plaster shall- be used for walls and ceilings wherever plastered areas occur in kitchens, bath, showers, utility, toilet and service sink rooms and other spaces subject to higher humidity. Metal lath and accessories shall be galvanized when used in such areas.

(2) Exterior walls shall be furred for plaster.

(3) Acoustical plaster will not be permitted, except with the written approval of DCAM.

b) The Tile Section shall include, but not be limited to, the following items: ceramic floor and wall tile, quarry tile, glass mosaic tile, brick pavers (1-1/2 inches or less), special shapes, setting materials and accessories.

(1) Designer shall use judgment as to whether a full bed system or a thin set system is to be specified. The size of the area, location and backup materials will be the determining factors.

(2) Specify full mortar bed system for floors and walls in wet areas.,

(3) Specify tile sizes, type (whether clay or porcelain) and color group.

(4) Large floor areas shall have perimeter and internal expansion joints. The joint filler shall be as specified in this Section. The sealant shall be furnished and installed under Section 07101, WATERPROOFING, DAMPPROOFING AND CAULKING.

(5) Use abrasive non-slip floor tiles in wet areas.

(6) Include waterproofing provisions for ceramic tile floor in wet areas above ground floor. Refer to Waterproofing, Dampproofing and Caulking Section for waterproofing utilizing copper pan system.

(7) When waterproofing is required, the Tile Section shall include the furnishing and installing of reinforcing system in setting bed.

(8) Include divider strip between dissimilar flooring systems. The divider strip shall be furnished and installed under the Section providing the first installation.

(9) Partitions constructed of metal studs, metal lath and scratch plaster coat will be installed by the Lathing and Plastering Section. In swimming pools only, the scratch

coat shall be included in the Tile Section. Consider tiles manufactured from recycled materials.

(10) All tile shall be "Tile Council of America" certified, first quality and of domestic manufacture and comply with ANSI A-137.1 United States Standard for Ceramic and Quarry Tile.

(11) In large installations specify an extra 100 sq. ft. of a mixture of all sizes, shapes and colors to be supplied to the User Agency.

(12) Include marble thresholds under this Section when there is no Marble Section.

(13) In bathrooms, utility rooms, service sink rooms, showers and the like, ceramic tile shall extend full height from the floor to the underside of suspended and/or exposed ceiling.

(14) All tiles shall be installed with low VOC adhesives (see Appendix N).

c) The Terrazzo Section shall include but not be limited to the following items: sand cushion terrazzo floors, bond to concrete terrazzo floors, thin set terrazzo, conductive terrazzo floors, pre-cast terrazzo, and plastic-matrix terrazzo.

(1) Specify color of cement and whether color shall be added.

(2) Specify source or aggregate whether domestic or foreign. Indicate recycled content if applicable.

(3) Coordinate the proper depression and finish of under slab systems to receive terrazzo.

(4) Structural slab finish to receive thin set systems shall be steel-troweled as for resilient flooring application.

(5) For stair treads and ramps, specify a non-slip finish.

(6) Specify adequate heating requirements for installations of terrazzo systems.

(7) Provide for adequate power and water requirements on each floor to receive terrazzo.

(8) Standard conventional terrazzo shall not be used in any toilet or shower rooms or other rooms that are subject to detrimental acid attack and/or periods of wetting.

(9) Pre-cast terrazzo shower receptors will be furnished and installed under the Plumbing Section.

(10) Provide for cleaning and waxing of floors.

(11) Floors will be protected by the General Contractor after installation.

d) The Acoustical Tile Section shall include but not be limited to the following items: acoustical panels, acoustical tiles, ceiling suspension systems, grid systems and ceiling hangers.

(1) Shop drawings and duplicate samples of ceiling panels, suspension system and accessories shall be submitted.

(2) Designer shall provide reflected ceiling plans on Construction Drawings indicating layout and pattern of acoustical units and cut tiles. Details shall also be provided at changes of levels, at ceiling penetrations, access doors, special edge treatment and all necessary accessories of other trades.

(3) Consideration shall be given to the need for acoustical control due to excessive noise levels emanating from mechanical and/or electrical systems.

(4) Extra tile units shall be provided at the rate of one percent of each type of tile units installed.

(5) Moisture-resistant tiles shall be specified for high-moisture areas.

e) The Marble Section shall include, but not limited to, the following items: marble toilet and shower compartments, marble counters, cladding, fixed marble furnishings including fountains, thin skin exterior and interior :marble cladding, granite, and limestone walls and facings, marble and pre-cast terrazzo treads and risers, blue stone and slate walls and floors, and stone window stools and thresholds.

(1) Specify quality of each type of stone to be used.

(2) Specify non-staining caulking. All ties shall be brass.

(3) Specify the sealing of backs of exterior wall stone.

f) The Resilient Floors Section shall include, but not be limited to, the following items: vinyl asbestos tile, asphalt tile, vinyl tile, rubber and other resilient tile, resilient sheet flooring, linoleum, resilient vinyl or rubber bases, resilient stair treads and adhesives.

(1) Select proper resilient flooring materials and adhesives for below-grade applications.

(2) Determine availability of specific sizes of tiles for resilient systems specified.

(3) "Inspect all surfaces and assure that they are in proper condition to receive work to be performed under this Section. The starting of work on any floor or any space or area will be construed as acceptance of such surfaces as being satisfactory and any defects to the surface will be corrected under the work of this Section."

(4) Provide for a minimum quantity of extra flooring to be supplied by Flooring Subcontractor.

(5) Specify cleaning, waxing, and protection of all resilient flooring. Cleaning and waxing shall be the last operation prior to Final Acceptance or Use and Occupancy.

g) The Painting Section shall include, but not be limited to, the applicable items listed below.

(1) Paints; including fire retardant paint, enamel, varnish, shellac, lacquer, wood filler, crack filler, colored wax and stain, high performance architectural coatings, and surface preparation.

(2) Wall coverings; including wallpaper, wall fabric, vinyl and flexible wood sheets.

(3) Specifications shall include storage and protection of equipment, materials, and surfaces, preparation of surfaces, quality assurance and method of application of paints and finishes.

(4) Include a painting schedule in the Specifications for describing coating systems for all surfaces.

(5) Provide for field painting of all non-galvanized or corrosive type metals with two coats of a rust inhibitive paint. Concealed surfaces shall be painted prior to installation.

(6) Specify back painting or treatment for all interior and exterior wood surfaces that will be concealed after installation.

(7) Specify low VOC paints and finishes. (see **Appendix N**)

11. Specialties

Requirements

a) The Fire Protection Specialties Section shall include the furnishing and installation of fire extinguishers and fire extinguisher cabinets.

b) The Toilet and Bath Accessories Section shall include the furnishing only of toilet and bath accessories. These items will be installed by the Plumbing Subcontractor under the Plumbing Section.

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12. Conveying Systems

Requirements

[Note to Designer: Plans and specifications for elevators should be prepared by either an elevator consultant QEI Certified or an electrical/mechanical engineer with recent elevator experience]

a) Filed Sub-Bid Section 14201 ELEVATORS shall include elevators, dumbwaiters and moving stairs. Refer to CSI MASTERFORMAT for other conveying systems which shall be specified and bid independently of Section 14201 ELEVATORS.

(1) Designer shall note that requirements for elevators, including disconnect switches, shall comply with the rules and Regulations of the Board of Elevator Regulations, under the Mass. Dept. of Public Safety.

(2) Designer shall coordinate all elevator requirements with the requirements for the Massachusetts Architectural Access Board.

Standards

[Note to Designer: The following paragraphs shall appear in Part 1 General, of all Sections within this Division. Adjust numbering and lettering of articles and paragraphs to suit the indexing example in these instructions].

a) Qualifications

(1) The Elevator Subcontractor shall be regularly engaged in the installation and maintenance of elevators of the type specified herein and shall have installed elevators in the Commonwealth which have provided satisfactory operation prior to the date of receipt of general bids for this project.

b) Service

(1) Provide maintenance and callback service for a period of one year after the date of final acceptance of the project by DCAM. Maintenance service shall consist of at least monthly inspections, lubrication, and adjustment of equipment. Callback service shall consist of immediately providing all intermediate maintenance service calls requested by the User Agency.

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13. Mechanical (Fire Protection)

Requirements

a) The Fire Protection System shall include, but not be limited to, sprinkler systems, sprinkler heads, standpipe equipment and fittings, foam generating equipment, carbon dioxide equipment, fire pumps, hose and valve cabinets, and Fire Department tie-in. Designer shall check with area city or town for any local Fire Department requirements. Written approval from the local Fire Department shall be forwarded to DCAM by the Designer.

All fire protection systems shall be sized by the Designer and shown on the fire protection drawings.

(1) Refer to DIVISION I - GENERAL CLOSEOUT SECTION for Record Drawing requirements.

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14. Mechanical (Plumbing)

Requirements

a) The Plumbing Section shall include, but not be limited to, the following items. These items are indicated for outline purposes and are not intended to be specific subtitles within the final Section.

(1) Basic Materials and Methods: including pipe, pipe fittings, specialties and supporting devices, valves, pipe and valve identification, painting (when not covered in the Painting Section), pumps, and vibration isolation.

(2) Insulation: including pipe insulation and equipment insulation.

(3) Water Supply and Treatment: including chlorination system, water distribution system, water transmission system, intakes, and interior storage tanks and reservoirs.

(4) Plumbing sanitary and storm drainage (to 10'-0" outside Bldg.), domestic water heating equipment, domestic water cooling equipment, domestic water conditioning equipment, distilled water system, fixtures and trim and accessories, compressed air equipment, vacuum equipment, special piping systems, and gas lines and equipment.

(5) Controls and Instrumentation: including pressure gauges, temperature gauges, recording devices, indicating and alarm devices, and control panels.

(6) The Plumbing Section shall include the standard paragraphs hereinafter indicated as "Materials and Installation," and "Valve Tags, Nameplates and Charts."

(7) The Plumbing Subcontractor shall be required to install the permanent connection from the water supply main at the point shown on the drawings, and the permanent service line to the building, at the start of the work, when requested by the General Contractor in order that water may be available for construction purposes. The Plumbing Subcontractor shall provide a meter, if required. Any temporary pipelines from the permanent service line shall be installed by and at the expense of the General Contractor in accordance with SECTION 01500: CONSTRUCTION FACILITIES-AND TEMPORARY CONTROLS. When temporary hydrants are to be provided, the local Fire Department shall notify the Designer as to the number and their locations.

(8) All work in connection with leveling, caulking and making of all joints shall be included in the Plumbing Section, and shall be indicated on the Plumbing or Site drawings.

(9) Furnish access panels and doors adequately to allow access for valve operations, replacements and maintenance. Properly identify all access panels and doors. Access panels where required for Plumbing work shall be furnished by the Plumbing Subcontractor and turned over to the General Contractor for installation under the proper trade.

(10) Pipe joints, caulked joints (lead and oakum) or hub-less joints shall be specified for storm, vent and sanitary lines above grade where cast iron pipe is used in accordance with Mass. State Plumbing Code. Resilient gasket joints may be specified for water, storm and sanitary cast iron lines below grade where conditions permit. Mechanical grooved pipe shall only be installed within mechanical rooms.

(11) Specify pipe support distances that comply with requirements of the Massachusetts State Plumbing Code. Pipe supports shall be hung from the building structure and not from ducts or other pipes. No penetration of ducts will be permitted.

(12) The Plumbing Subcontractor shall submit a letter to the Designer describing method of chemically treating any system prior to undertaking treatment.

(13) Toilet and bath accessories shall be furnished by the General Contractor and installed by this section.

Standards

[Note to Designer: The following articles shall appear in Part I General, of this Section. Adjust numbering and lettering of articles and paragraphs to suit the indexing example in these instructions.]

a) The Plumbing Section shall include the following:

(1) Materials and Installations

(a) Materials and installations shall conform with the requirements of 248 CMR Mass State Plumbing Code, as formulated by the Board of the State Examiners of Plumbers and Gas Fitters. The Plumbing Subcontractor shall apply to the Board for the proper permits to perform the work under this contract.

(b) The availability of a "Certificate of Approval" from the Board of the State Examiners of Plumbers and Gas Fitters shall be a prerequisite to scheduling a final inspection of this contract. Non-availability of this Certificate may be grounds for cancellation and postponement of the scheduled inspection by DCAM.

(c) The materials and installation of gas work shall conform to the requirements of the Board of the State Examiners of Plumbers and Gas Fitters.

(d) Emergency wash systems shall be tempered in accordance with 527 CMR Board of Fire Prevention Regulations.

(2) Valve Tags, Name Plates and Charts

(a) All valves on pipes of every description shall have neat circular brass valve tags of at least 1-1/2 inches in diameter, attached with brass hook to each valve stem. Stamp on these valve tags in letters as large as practical, the number of the valve

and the service, such as: "H.W.", "C.W.", for hot water and cold water respectively. The numbers of each service shall be consecutive.

(b) All valves on tanks and pumps shall be numbered by 3-inch red metal discs with white numbers 2 inches high secured to stem of valves by means of brass hooks or small solid link brass chain.

(c) These numbers shall correspond to numbers indicated for valves on the Record Drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and the fixture or group of fixtures which it controls, and other necessary information, such as, requiring the opening or closing of another valve or valves, when any one valve is to be opened or closed.

(d) These printed lists shall be prepared in form to meet approval of the Designer and shall be framed under glass.

(e) Nameplates, catalog numbers and rating identification shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

(3) Refer to DIVISION 1, GENERAL CLOSEOUT SECTION for Record Drawings' requirements.

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15. Mechanical (HVAC)

Requirements

a) The HVAC Section shall include, but not be limited to, the applicable items listed below. These items are indicated for outline purposes and are not intended to be specific sub-titles within the final Section.

(1) Basic Materials and Methods: including pipe, pipe fittings, specialties and supporting devices, valves, pipe and valve identification, painting, when not covered in the Painting Section, pumps, and vibration isolation.

(2) insulation for pipes, ducts and equipment.

(3) Heat Generation: including boilers, boiler feed-water system, condensate return systems, burners, fuel handling and storage, draft control, ash handling, cleaning devices, and de-aerators.

(4) Refrigeration: including chillers, compressors, condensing units, cooling towers, air-cooled condensers, evaporative condensers, heat exchangers, and special cooling devices and systems.

(5) Liquid and Vapor Heat Transfer: including steam, hot water and chilled water specialties, heat exchangers, coils, convectors and radiators, baseboard and wall fin tube, coolers, unit heaters, unit ventilators, air handling units, radiant units, packaged heating and cooling, process heating, and storage cells and devices.

(6) Air distribution: including air handling units, direct fired unit heaters, fans, gravity ventilators, ductwork, outlets and inlets, specialties and dampers, roof inlets and outlets, filters, sound attenuators, mixing boxes, air-washers, radiant units, humidifiers, fire dampers, duct liners, dust collectors, and fume collectors.

(7) Controls and Instrumentation: for heating and cooling, special process, pressure gauges, temperature gauges, recording devices, indicating and alarm devices, control panels, thermostats, and energy management systems.

(8) Testing, Adjusting and Balancing.

b) Designers shall provide sufficient space and access to mechanical and electrical rooms to allow for operating, maintenance and/or replacement of equipment.

c) Specifications for control tubing shall be designed for either copper or plastic type tubing, rather than combinations of both. Precise language shall detail information as to hanging, connections, sleeving and type of materials to be installed in control panels. Designer shall note that plastic tubing is permissible for use within or behind control panel.

d) All piping, ductwork and control tubing, inline fans and other equipment shall be hung from building structure independent of other trades.

e) Furnish access panels and doors adequately for valve operations, replacements and maintenance. Access panels where required for HVAC work, but not shown on architectural drawings, shall be furnished by the HVAC subcontractor and turned over to the General Contractor for installations under the proper trade.

f) For projects which involve cooling towers, the basic specifications should cover the construction requirements for the cooling towers to provide a fireproof permanent type cooling tower, having aesthetics and life expectancy in keeping with total project concept, and with full thermal efficiency throughout their life to afford minimum operating costs and minimum maintenance expenses. The following are required characteristics:

(1) Absolute minimum preventive maintenance and maximum corrosion protection.

(2) Means of Fire Protection and Explosion Protection, if required.

(3) No free water carryover from fan stacks to spot surrounding buildings, or cars. Cooling towers shall be located to not cause health problems to building occupants as well as surrounding public areas.

(4) Noise level: It is the Designer's responsibility to insure in its design that noise levels created by the cooling tower will not be objectionable to the building occupants or the surrounding neighborhood and within the legal limits.

(5) Tower design and selected materials of construction shall have guaranteed life expectancy of not less than 10 years for package towers and 20 years for field-erected towers. A guarantee for fill shall be in accordance with design specifications recommended by the Designer and approved by DCAM taking into consideration the geographical locations and atmospheric conditions of the installation.

(6) Special consideration shall be given to vibration and isolation requirements for each tower application.

(7) Testing: The cooling tower to be furnished, shall be from the line of towers which has been certified by the Cooling Tower Institute.

(8) Tower shall be designed for energy efficiency.

g) All cathodic protection will be provided under DIVISION 16 ELECTRICAL.

h) Provide for containment of oil spillage for all tanks.

i) Pipe loops shall be the preferred method of design for thermal expansion in main piping systems.

j) The selection of an underground conduit piping system shall be determined by the Designer in accordance with project need and economic feasibility. The conduit system shall be a complete system under this Section with the exception of excavation and back filling, which will be performed by the General Contractor. The Designer shall size and include all anchors and expansion loops for the system.

k) All new and replacement boiler room designs shall include the following:

(1) All vessels and tanks shall be constructed to comply with the American Society of Mechanical Engineers Code. Tanks and vessels that are not provided with permanent vents to the atmosphere shall be provided with ASME rated relief valves containing lifting levers and pressure gauges. Thermometers shall be provided in vessels where temperatures are to be maintained.

(2) Every pressure reducing station shall be provided with sectionalizing valves, a valved bypass, strainer, high and low pressure gauges, and an ASME rated relief valve on the low pressure side with a relieving capacity equal to the capacity of the reducing valve.

(3) All boilers where applicable shall be equipped in an approved manner with injectors in addition to all other equipment for feeding water to the boiler.

(4) All floor conditions shall be checked for adequate support for new boiler.

(5) Boiler ratings shall be identified in specific terms, i.e., pounds per hour, net and gross IBR ratings, DOE rating, etc.

(6) Boiler efficiency shall be identified as determined by Fuel to Steam ratio, where applicable.

(7) All associated equipment, including de-aerators, boiler feed pumps, condensate receivers etc., where applicable, shall be compatible with capacities to accommodate new and/or replacement boiler systems. Include computations.

1) In the Basis of Design, describe energy conservation equipment that may be advantageous to the installation. Make recommendations and include computations. Submit with Life Cycle Cost Analysis.

m) Mechanical ventilation shall be provided for toilet areas and shall include a continuous sheet metal enclosure with air discharged to atmosphere.

n) Cleaning and Water Treatment:

(1) All water piping systems shall be chemically cleaned and flushed and all systems shall be treated accordingly.

o) Protection:

(1) Protect all mechanical work from damage. All ductwork shall be delivered to the site clean and dry with both ends sealed. Equipment and ductwork shall be kept clean and dry at all times during storage.

(2) Cover all openings in equipment, pipes, and ducts with caps or heavy gauge plastic sheeting at the end of each work day until final connections are made.

(3) Protect all mechanical work from weather damage.

p) Ceilings shall not be used as plenums for supply or return air systems. Supply and return air systems shall be fully ducted.

q) VAV systems shall be designed to ensure the minimum air setting does not allow the outside air requirements to drop below ASHRAE and BOCA Mechanical Code requirements.

r) All ducts, fans, and equipment shall be thoroughly cleaned inside and outside and blown out to prevent any debris from damaging fan shields or debris hanging through registers or diffusers when systems are placed into operation. All temporary connections required for blowing out the systems, cheesecloth/filters for all duct openings, and any other equipment or labor for cleaning, shall be provided by the HVAC contractor. The entire HVAC system shall be kept clean until final acceptance. Any damage to ceilings by the HVAC contractor shall be rectified by him at no additional charge to the Owner, to the satisfaction of the Architect.

Standards

[Note to Designer: The following paragraphs shall appear in PART 1 GENERAL, of this Section. Adjust numbering, and lettering of articles and paragraphs to suit the indexing example in these instructions.]

a) The HVAC Section shall include the following:

(1) Heating During Construction

(a) Special reference is made to Construction Facilities and Temporary Control's Section in DIVISION 1.

(b) The HVAC Subcontractor shall coordinate its work with the progress of construction so that the permanent heating system will be ready to provide heating during construction as soon as the building is closed in. Prior to use the Contractor shall submit to DCAM their proposed method for maintaining a clean system (ducts, coils and equipment) if prior approval was given for the system to be used during construction or if the system was contaminated by construction debris without use. The permanent system can not be used with out DCAM approval.

(c) The General Contractor will pay the HVAC Subcontractor for all water treatment, and to operate and to thoroughly clean and put in first-class condition any portion of the permanent heating system used for heating during construction.

(2) Valve Tags, Nameplates and Charts

(a) The HVAC Subcontractor shall furnish and install on each valve used in its contract, a brass tag of at least 1-1/2 inches in diameter, with stamped numerals

painted white. The tags shall be attached to the valve handles or stem necks with brass hooks or chains and properly secured.

(b) These numbers shall correspond with numbers indicated for valves and controls on the record drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and control and the section, or equipment which it controls, and other necessary information, such as requiring the opening or closing of another valve when one valve is to be opened or closed.

(c) These printed lists shall be prepared in a form to meet the approval of the Designer and shall be framed under glass.

(d) Nameplates, catalog numbers and rating identifications shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

(3) Refer to DIVISION 1, Contract Closeout Section, for Record Drawing requirements.

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16. Electrical

Requirements

a) The Electrical Work Section shall include, but not be limited to, the applicable items listed below. These items are indicated for outline purposes and are not intended to be specific sub-titles within the final Section.

(1) Basic Materials and Methods: including motors and motor controls, over-current protection, conductors, raceways, supporting devices, wiring devices, disconnects and conductor insulation integrity testing.

(2) Power Generation: including emergency generator, transfer switch, remote annunciator, emergency power for emergency systems, life safety, legally required standby systems, optimal standby systems, fire pump, HVAC, and information technology centers.

(3) Power Transmission: including switch stations, switch gear, vaults, transformers, and over-current protective devices.

(4) Service and Distribution: including incoming service equipment, metering, grounding, service disconnects, rectifiers, converters, transformers, switchboards and panel boards, load centers, relays and overload protective devices. Power factor correction, transient voltage surge suppression, and field testing of all installed equipment.

(5) Lighting: including energy efficient interior and exterior lighting fixtures, street and highway, athletic or assembly, signal, lamps, ballasts, emergency lighting, exit lights, lenses and filters, shields and diffusers, reflectors, and programmable lighting control systems and occupancy sensors.

(6) Special Systems: lightning protection and cathodic protection when required.

(7) Communications: including telephone (coordinate with Utility), television (empty conduit), radio, microwave, public address, paging, nurses call, alarm and protection, clock and program, commercial projection systems.

(8) Heating and Freeze Protection: including electric radiation and electric unit heaters and heat trace (cable) for freeze protection.

(9) Controls and Instrumentation: including process controls, recording devices, indicating devices, starters and motor control centers, fire actuated, temperature actuated, limit switches, time activated, smoke and heat sensors and photoelectric sensors. (Cross reference with HVAC.)

(10) Fire Alarm System: including conduit, control panel, remote annunciator panel, master box, digital communicator, manual pull stations, smoke detectors, beam detectors, heat detectors, magnetic door holders, HVAC duct smoke detectors, speakers, strobes, and fire alarm/HVAC interface.

(11) Security System: including conduit, control panel, motion sensors, glass break detectors, door contacts, card access system, delayed egress systems, and closed circuit TV.

(12) Special Equipment: including, but not limited to, conveyors, trash compactors, lifts, dock levelers, elevators, and escalators.

(13) Project Demolition: including equipment, feeders, branch circuits, proper disposal of hazardous waste and recycling of PCB containing ballasts.

(14) Information Technology Equipment: including data cabling, equipment rooms, HVAC requirements, uninterrupted power supplies, grounding, emergency power off, fire suppression system, and leak detection systems.

(15) Fire Pumps: including raceways, conductors, utility company meter cabinet and all required power wiring.

(16) Telephone/Data System: including raceways, cable trays, patch panels, termination jacks, CAT-5/fiber optic cables and terminations (PBX system and telephones as requested by user).

b) Designers shall provide sufficient space in mechanical, electrical, and telephone/data rooms to allow for operation, maintenance and/or replacement of equipment.

c) All electrical equipment, conduits, and light fixtures shall be independently hung from the building structure.

d) Only copper conductors shall be used.

e) Designer shall prepare all applications for applicable utility rebates.

Standards

[Note to Designer: The following paragraphs shall appear in PART 1 GENERAL, of this Section. adjust numbering and lettering of articles and paragraphs to suit the indexing example in these instructions.]

a) The Electrical Work Section shall include the following:

(1) Temporary Lighting
[Note to Designer: Determine if the Commonwealth (institution, in question) can provide electric energy for this project, or if it will have to be purchased from a utility company. Your determination shall be based on power required for temporary services and the availability to provide sufficient power from the institution if possible, or from a local utility. A letter from your office documenting your recommendation shall be forwarded to DCAM along with your B-4 submittal. Unless otherwise determined, the General Contractor will pay for all temporary power. This Section and the related references in DIVISION 1, Construction Facilities and Temporary Controls' Section shall be coordinated.]

(a) The Electrical Subcontractor shall furnish and install feeders of sufficient size from the institution's or, local utility company's, power lines, at the point designated on contract drawing NO. E- _____ to provide volt, phase, wire, 60 Hertz service for the electric light and power requirements for the building while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, amps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards or Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.

(b) All necessary transformers, meters, cables, panel boards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.

(c) The Electrical Subcontractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the entire floor and s/he shall provide a sufficient number of ground fault current interrupter outlets, located at convenient points, so that extension cords of not over 50 ft. in length will reach all work requiring temporary light or power.

(d) The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and the Resident Engineer as specified in the contract form.

(e) All temporary electrical work shall meet the requirements of the Massachusetts Electrical Code Article 305 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.

(f) All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.

(g) The General Contractor will pay for the cost of electric energy consumed by himself and by all of its Subcontractors, unless otherwise indicated.

(h) Electric energy, if provided by the Commonwealth, may be discontinued if, in the opinion of DCAM, it is wastefully used. Then, DCAM will direct the General Contractor to pay for the furnishing and installing, by the Electrical Subcontractor, of a watt-hour demand meter and associated current transformers and, if required, potential transformers to measure energy consumed from the Commonwealth. The General Contractor will then pay for all energy consumed from the Commonwealth for the remainder of the construction period.

(i) All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.

(j) Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 1/2 hour before and 1/2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

[Note to Designer: The following paragraph shall be utilized when electric heating is specified for the permanent heating system.]

(2) Heating During Construction

(a) Special reference is made to Construction Facilities and 'Temporary Control's Section in DIVISION 1.

(b) The Electrical Subcontractor shall coordinate its work with the progress of construction so that the permanent heating system will be ready to provide heating during construction as soon as the building is closed in.

(3) Lamp Ballasts Containing PCBs: Specify that the General Contractor or electrical sub-contractor will be responsible for the proper handling, disposal and storage of fluorescent lamp and HID fixture ballasts containing or suspected of containing PCBs in accordance with applicable local, state, and federal laws and regulations. MGL Ch. 333 Acts of 1996 requires DCAM projects to recycle mercury-containing lamps.

(4) Lamps Containing Mercury: Specify that the General Contractor or electrical sub-contractor will be responsible for the proper handling, disposal and storage of fluorescent lamp and HID fixture ballasts containing or suspected of containing mercury in accordance with applicable local, state, and federal laws and regulations.

(5) Refer to DIVISION 1, Contract Closeout Section for Record Drawings' requirements.

APPENDICES

[Note to Designer: The Designer shall review all samples within the APPENDICIES and shall utilize those samples that are applicable to the project. Unless otherwise approved in writing by DCAM, all criteria indicated in the samples shall be followed.]

List of Appendices

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Appendix A

Schedule of Procedures

Selection of Designer

Step No.	Subject/Documents	Correspondence/Action	Remarks
A1	The Designer Selection Board (DSB) is notified to advertise for finalists in accordance with C7 Section 3OF	Letter from Commissioner to Executive Director of the Designer Selection Board	Original list prepared by DCAM from Capital Outlay appropriations and studies.
A2	The Designer Selection Board prepares a Public Notice List of DCAM Projects, including building projects for other state agencies and advertises the availability of the Public Notice List.	Public Notice Advertisement sent from DSB to Professional Societies, major newspapers, the Central Register, and the State Office of Minorities and Women Business Assistance (SOMWBA),	Pertinent project data furnished by Designer Selection Board and the various offices of DCAM.
A3	The Designer Selection Board writes a Public Record Letter to Deputy Commissioner of DCAM selecting at least 3 finalists in ranked order for his/her appointment as Project Designer.	Letter from Designer Selection Board to Commissioner of DCAM.	Designer Selection Board having reviewed all applications, submits names of at least three selected finalists in rank order. Copies of letter will be transmitted to finalists.
A4	The Deputy Commissioner of DCAM notifies the respective Director of DCAM of its appointment of a Project Designer, and instructs the Director to enter into a contract.	Letter from the Commissioner of DCAM to the appropriate Director of DCAM confirming the assignment of this specific project.	The Commissioner of DCAM shall appoint a Designer in accordance with the conditions of Chapter 7, Section 38G, of the General Laws. A copy of the letter is sent to the Design Selection Board. DSB publishes results in the Central Register.

Step No.	Subject/Documents	Correspondence/action	Remarks
A5	The DCAM will issue a notice of selection including five (5) contracts enclosed for execution .	Letter from DCAM to Designer.	letter stipulates acceptance to appointment notice.
A5 Amendment	The DCAM will resolve issues with the Designer.	Letter from DCAM to Designer.	Contract is amended for special reasons during the life of the design contract.
A6	The Designer responds to DCAM accepting appointment and conditions	Letter from Designer to DCAM.	
A7-A	The Designer shall submit its list of Consultants for approval	Letter from Designer to DCAM.	Approval of the list occurs after contracts are executed.
A7-B	The DCAM will review and approve Consultants and will notify the Designer.	Letter from DCAM to Designer.	
A8	The Designer shall return five (5) sets of executed contracts.	Documents from Designer to The Office of Finance and Administration	The Office of Finance and Administration checks for complete execution i.e., signatures, insurance, financial disclosures, etc.
A9	The Office of Finance and Administration will deliver five (5) sets of the Designer's contract documents to the Director of the Office for his/her signature.	Documents from The Office of Finance and Administration to the Director of the Office.	

Step No.	Subject/Documents	Correspondence/action	Remarks
A10	The Director will return executed sets of the Designer's contract for distribution to the Office of Finance and Administration.		
A10-A	Comptroller stamp is required on '670" Form before contracts and Notice to Proceed can be sent to the Designer		
A11	The Office of Finance and Administration will distribute executed contracts to Designer, Comptroller, Director of the Office, the Project Manager and the Fiscal Section. The Designer will receive a Notice to Proceed.		

Type 1 Contracts - Studies (Refer to DCAM-Guidelines for Studies of Building Projects)

Type 2 Contracts (Phase 1 - Schematic Phase**)**

B-CONF	Initial Project Conference (B-Conference) will be held at DCAM attended by the Project Manager and agents of DCAM, Designer, and the User Agency. DCAM shall submit copies of pertinent report studies and the program as approved by the Commissioner and the User Agency. The purpose of the conference is to introduce all parties that are involved in the project's development and to discuss the following items: The program and space requirements, previous studies, site selection, the estimated construction cost, the schedule of submittals for schematics, the tentative bid date, the need for surveys or sub-soil investigations, and involvement of other agencies, i.e., Department of Public Safety, Environmental Regulations and Massachusetts Architectural Access Board. Additional conferences at site may be necessary. The Designer shall prepare conference memorandum and shall submit to DCAM with a copy to the User Agency and all persons in attendance.

Schedule of Procedures (continued)

Step No.	Subject/Documents	Correspondence/action	Remarks
B1	The Designer shall submit six (6) sets each of schematic drawings, basis of design, outline specifications and cost estimates to DCAM. The Designer shall indicate its recommendation.	Letter and two copies from Designer to DCAM.	DCAM proceeds with review of schematic documents.
B2	The DCAM transmits three (3) sets of schematic documents to User Agency or requests the Designer to transmit drawings to the User Agency when authorized by DCAM.	Letter from DCAM to User Agency.	User Agency conducts review of schematic documents.
B3	The User Agency will return two (2) sets of schematic documents with comments and/or approval to DCAM	Letter and two copies from User Agency to DCAM.	Agency notes corrections on all documents returned.
B3-A	The DCAM will return to Designer, and User Agency, one (1) set of schematic documents approved as to general arrangement with corrections noted, if required. The Designer shall be instructed to proceed with the Design Development Phase .	Letter from DCAM to Designer with copy to User Agency.	Form letter DCAM - B3k. DCAM notes all corrections on approved sets.
B3-A-Conf.	Conference will be conducted by DCAM, Designer and User Agency will discuss Design Development requirements.	Letter from DCAM initiating time and date of conference at DCAM or site.	The Designer prepares conference memorandum and submits it to DCAM with a copy to the User Agency.

Phase 2 -- Design Development

Step No.	Subject/Documents	Correspondence/action	Remarks
B4	The Designer shall Submit six (6) sets each of Design Development drawings, basis of design, outline specifications and cost estimates to DCAM.	Letter and two copies from Designer to DCAM.	DCAM proceeds with review of Design Development documents.
B5	DCAM will transmit three (3) sets each of-Design Development documents to the User Agency, or requests the Designer to transmit drawings to the User Agency when authorized by DCAM.	Letter from DCAM to User Agency.	User Agency conducts review of Design Development documents.
B6	User Agency will return two (2) sets of drawings with comments and/or approval to DCAM.	Letter and one copy from User Agency to DCAM.	Agency notes corrections on all documents returned.
B6-A	DCAM will return one (1) set of Design Development documents to Designer for resubmission, if disapproved by DCAM.	Letter from DCAM to Designer with copy to User Agency.	The Designer resubmits, as required, Design Development documents under step B4
B7	DCAM will return to the Designer and User Agency, one (1) set of Design Development documents approved with corrections noted, if required. The Designer shall be instructed to proceed with the preparation of construction documents to be made on 4 mil mylar	Letter from DCAM to Designer with a copy to User Agency.	DCAM notes all corrections on approved sets.

Phase 3 -- Construction Documents

C-CONF	Major Project Conference IC-Conference) shall be held at DCAM, attended by representative of DCAM, Designer, and the User Agency. The purpose of the conference is to discuss comments and corrections on approved Design Development documents, as well as the following items: the fulfillment of the program and space requirements, the estimated construction cost and the total project cost, furnishing and equipment cost and preparation of itemized list, and review and update the schedule of submittals and bid date. The materials specified shall be of better than average quality. Three manufacturers shall be named or a performance specification shall be utilized that can be &et by three manufacturers. All related items or special conditions, i.e., alternates, unit prices, proprietary items, shall be discussed. Additional conferences at site may be necessary. The Designer shall prepare conference memorandum and shall submit it to DCAM with a copy to the User Agency and all parties present.

Schedule of Procedures (continued)

Step No.	Subject/Documents	Correspondence/action	Remarks
C1	The Designer shall submit six (6) sets each of construction drawings, basis of design, specifications, and detailed cost estimates to DCAM.	Letter and two copies from Designer to DCAM.	For all state projects, the Dept. of Public Safety Inspector, the State Examiners of Plumbers, the local Fire Chief, the local Elect. Inspector and all other applicable agencies shall stamp two (2) sets of construction drawings, approved. For all county projects, the local Building Inspector, the local Building Inspector, the local electrical Inspector, the local Fire Chief and all other applicable Municipal agencies having jurisdiction shall stamp two (2) sets of construction drawings, approved.
C2	The DCAM will transmit three (3) sets of construction documents to User Agency or Designer is requested to transmit drawings to the User Agency when authorized by DCAM.	Letter from DCAM to User Agency.	Agency conducts review of construction documents.
C3	The User Agency will return two 12) sets of construction documents with comments and/or approval to DCAM.	Letter and two copies from User Agency to DCAM.	Agency notes corrections on all documents returned.

Step No.	Subject/Documents	Correspondence/action	Remarks
C4	The conference will be attended by DCAM, Designer and User Agency to discuss and agree on required revisions.	Conference at DCAM or site.	Designer prepares conference memorandum and submits it to DCAM with a copy to User Agency and all in attendance. if doc and all in attendance. if documents are not approved, the Designer shall inform DCAM of the expected resubmission date under Step C6.
C5	The DCAM will return one (1) set of the construction documents to the Designer for resubmission.	Letter from DCAM to Designer with copy to User Agency.	
C6	The Designer will resubmit six (6) sets of revised construction documents to DCAM.	Letter and two copies from Designer.	Refer to "Remarks" in step Cl.
C7	The DCAM will transmit three (3) sets of revised construction documents to User Agency or request the Designer transmit drawings to the User Agency when authorized by DCAM	Letter from DCAM to User Agency.	Agency conducts review of construction documents.
C8	The User Agency will return two(2) sets of construction documents with comments and/or approval to DCAM.	Letter and two copies from User Agency to DCAM.	Agency notes corrections on all documents returned.

Step No.	Subject/Documents	Correspondence/action	Remarks
C9	The DCAM will return to the Designer and the User Agency, one (1) set of construction documents approved with corrections noted.	Letter from DCAM to Designer with copy to User Agency.	Form letter - C9. Approved sets will have all corrections noted thereon.
C9-Conf.	The conference will be attended by DCAM, Designer and User Agency to discuss comments on construction documents .	Conference at DCAM.	Designer prepares conference memorandum and submits it to DCAM with a copy to User Agency.
C10	The Designer shall submit reproducibles and one (1) set of blue line construction drawings, basis of design, specifications and C10 cost estimate to DCAM.	Letter and two copies from Designer to DCAM.	Designer's letter shall include an explanation for rejecting any DCAM or User Agency's comments. Such explanations shall be listed in order of drawing numbers and specifications paragraph numbers.
C11	The DCAM Project Manager transmits reproducibles to the Office of Finance and Administration and the Bid section	Reproducibles and C-ll memorandum forwarded to the Office of Finance and Administration and the Bid Section.	Project Management Team prepares C-ll material.

Phase 4 - Bidding and Award

Step No.	Subject/Documents	Correspondence/action	Remarks
D1	Minimum wage rates will be requested by DCAM.	Letter from DCAM to Labor & Industries.	Federal wage rates will be requested it project is federally aided.
D2	Review bid documents for compliance with bidding procedures.		DCAM Bid section reviews bid documents
D3	The DCAM Bid section will send reproducible drawings and specifications to Blueprinter.	Originals from DCAM to Blueprinter.	DCAM specifies date for return of documents to DCAM.
D4	Legal Advertisement will be transmitted to central register and other publications	Advertisement from DCAM to publications.	DCAM instructs publications as to desired date for insertion.
D5	Printed drawings and specifications including originals furnished by DCAM shall be returned by the printer.	Printed documents from printer to DCAM.	Drawings and specifications will be available at the Bid Section for potential bidders.
D6	Statutory Filed Sub-bids have been submitted and publicly opened.	Filed Sub-bids submitted to DCAM.	Filed Sub-bids have been reviewed for conformity to specifications and law and a list of results will be transmitted to all bidders of record.
D7	General bids have been received.	Bids from General Contractor to DCAM.	General bids have been publicly opened and reviewed for conformity to law.

Step No.	Subject/Documents	Correspondence/action	Remarks
D8	Lowest bidder qualification has been evaluated by the Designer and DCAM. Letters of intent for KBB/VBA Subcontractors must be submitted within 5 days of bid opening.	Designer transmits recommendations by letter on low bidder to DCAM.	
D9	The Bid Section will send Contract Bid Documents to The Office of Finance and Administration.	For final authorized bid approval and memorandum of approval preparation.	
D10	Memorandum of Approval will be submitted with recommendation of the Director regarding award from the office of Finance and Administration.	Memorandum of Approval from Office Director to Commissioner.	
D11	Memorandum of Approval has been executed by the Commissioner.	Approval from Commissioner.	The Commissioner approves recommendation of the Director.
D12	The Office of Finance and Administration distributes the MOA.		
D13	The Office of Finance and Administration will establish Allotments and Capital Construction Input forms and prepare Notice of Award.	CC Input form D-14 Notice of Award letter	Funds are encumbered to cover initial obligations for construction contract.
D14	The Director of Office will notify the selected General Contractor of the Award.	Letter from DCAM to General Contractor.	Letter includes instructions to execute statutory subcontract forms with filed sub bidders

Step No.	Subject/Documents	Correspondence/action	Remarks
D14-A	The Director of Office will notify the General Contractor of Award Adjustments.	Letter from DCAM to General Contractor.	Substitution of filed sub bidders for previous allowances.
D15	The Office of Finance and Administration will transmit three (3) copies of contract for execution.	Letter from DCAM to General Contractor.	Federally aided projects require additional executed copy. Letter shall establish a return time.
D16	Executed contract documents shall be returned to The Office of Finance and Administration by the General Contractor.	Letter from General Contractor to DCAM.	The Office of Finance and Administration checks for proper execution of contract, signatures, insurance, bonds and Power of Attorney.
D17	The Office of Finance and Administration will transmit three (3) copies of the contract to DCAM Legal Counsel.		DCAM Legal Counsel approves contract as to matters of form.
D18	Three (3) copies of the contract documents will be returned from Legal Counsel to The Office of Finance and Administration		If contracts are not correct as to matters of form, the General Contractor complies with Legal Counsel's instructions.
D19	The Office of Finance and Administration will distribute contract documents and Notice to Proceed to the General Contractor, Comptroller, Project Manager, Designer and the Resident Engineer for State projects.	One executed set of Contract Documents to Comptroller, General Contractor and DCAM.	

Schedule of Procedures (continued)

Phase 4A - Acceptance

Step No.	Subject/Documents	Correspondence/action	Remarks
E	The DCAM will establish the date for the semifinal inspection.	Letter from DCAM to General Contractor.	Those present shall include General Contractor, Designer, Agency, DCAM, Department of Public Safety and any other municipal agency having jurisdiction.
E(s)	Agency may request certificate of Use/Occupancy	Letter from Agency to DCAM.	DCAM will issue Certificate of Use/Occupancy.
E2	The DCAM will establish a date for final inspection.	Letter from DCAM to the General Contractor.	DCAM issues Certificate of final Inspection after receipt of Record Drawings.
E3	The DCAM will notify the Agency within 30 days of the expiration of the guarantee period.	Letter from DCAM to User Agency.	User Agency will notify DCAM of any contract defects in sufficient fine to allow DCAM to contact the General Contractor to take corrective action. DCAM tiles are gathered and pertinent data microfilmed and records are sent to Central Storage with a record destruction date established.

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APPENDIX B

Meeting Minutes No.__

Date

Deputy Commissioner Construction Services
Division of Capital Asset Management
One Ashburton Place
Fifteenth Floor
Boston, MA 02108

Project Number: UA0000 DC-1
Project Name:

Attention: Project Manager

Attending: **Distribution:**

Dear Project Manager:

The following is a record of the above referenced meeting held at ____. The purpose of the meeting was to review the _____ submission:

		Action
012299.1	Description of item	Designer to respond by 12/5

[Designer Note: the item number can be any reasonable designation to allow the ability to track the item, this is the month/day/year/number]

All information presented is considered accurate unless written notice of the modification is received within 5 days.

Sincerely,

Designer

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APPENDIX C

CODE AND REGULATORY CHECK LIST

- ❑ Use Group
- ❑ Occupancy Load
- ❑ Construction Type
- ❑ Hazard Indices
- ❑ Fire Resistance Ratings of Assemblies
- ❑ Height and Area Limitation
- ❑ Egress Capacity
    - ❑ Doors
    - ❑ Number of doors
    - ❑ Corridors
    - ❑ Stairs
- ❑ Toilet Count
- ❑ Architectural Barriers Board Regulations
- ❑ Environmental Notification
- ❑ Sewer Connection
- ❑ Off-site Drainage
- ❑ Alarm Systems
    - ❑ Fire/ Smoke
    - ❑ Security
- ❑ Energy Building Code (summary of compliance check)
- ❑ Life Cycle Cost Analysis

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APPENDIX D

SAMPLE SPECIFICATION TITLE SHEET

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE

DIVISION OF CAPITAL ASSET MANAGEMENT

OFFICE OF _____

--- (User Agency---

SPECIFICATIONS FOR

MASSACHUSETTS STATE PROJECT, NO. _____ CONTRACT NO. _____

_____(project title) _____

_____(location) _____

FEDERAL DESIGNATION NO. _____ (if applicable)

_____(designer) _____

_____(signature) _____

(consultant) _____ _____ (consultant)

(signature) _____ _____ (signature)

_____ (consultant) _____

_____(signature) _____

Date _____ (C9 approval date)

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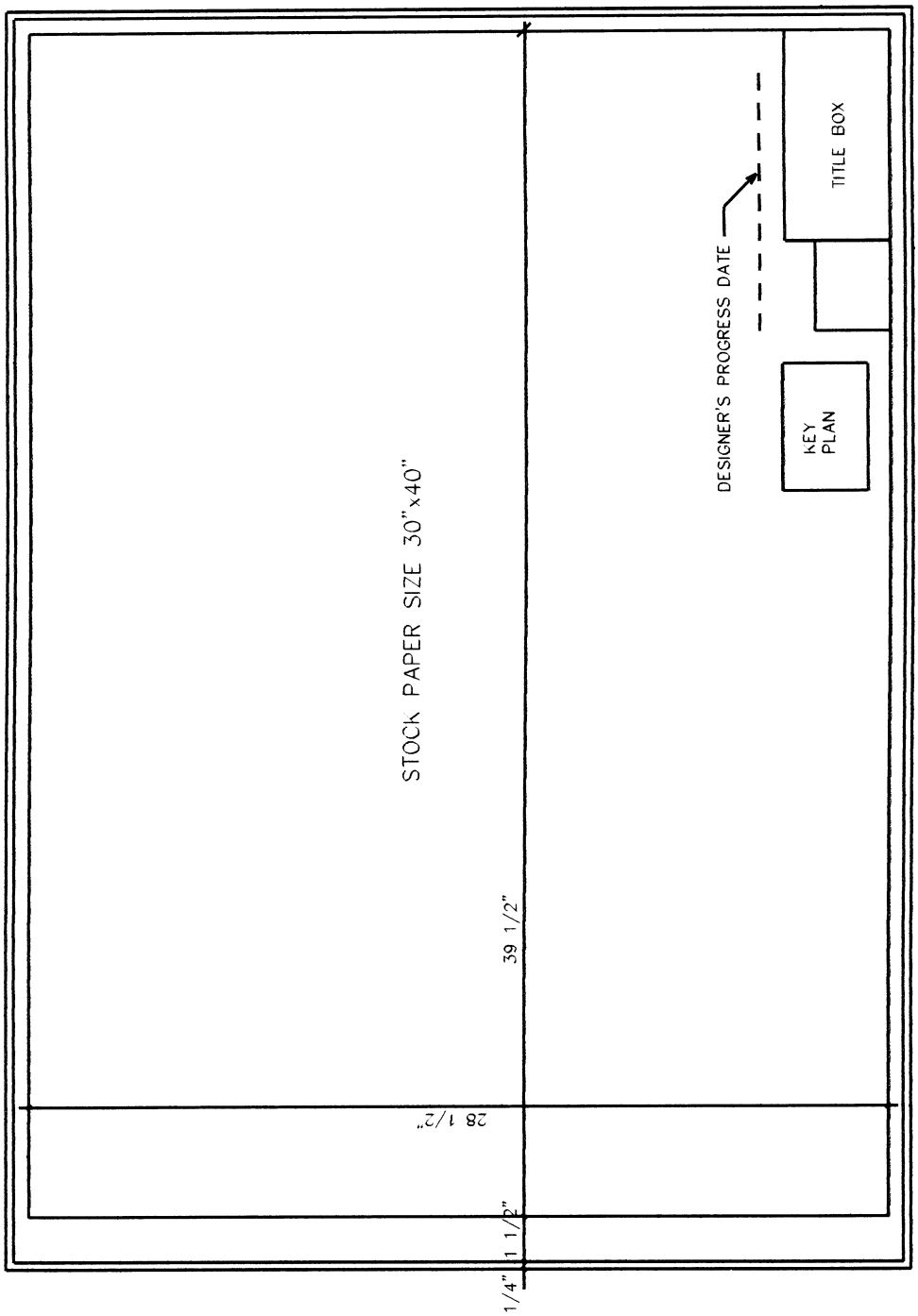
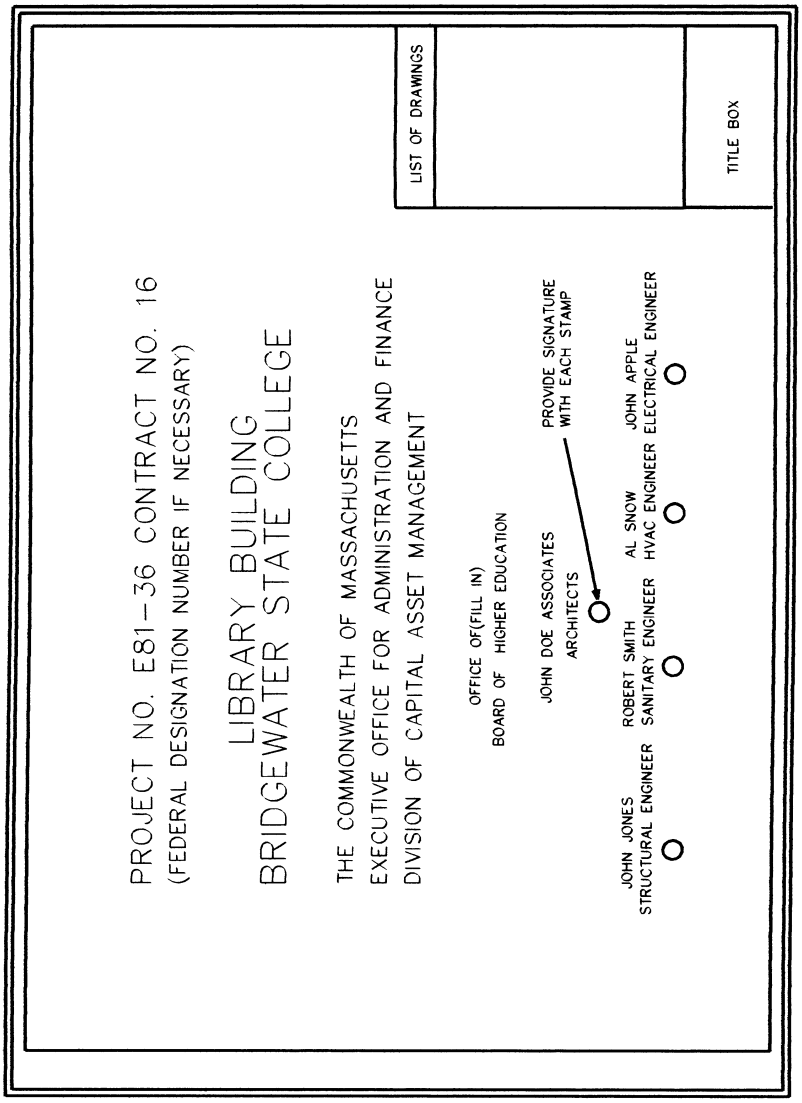
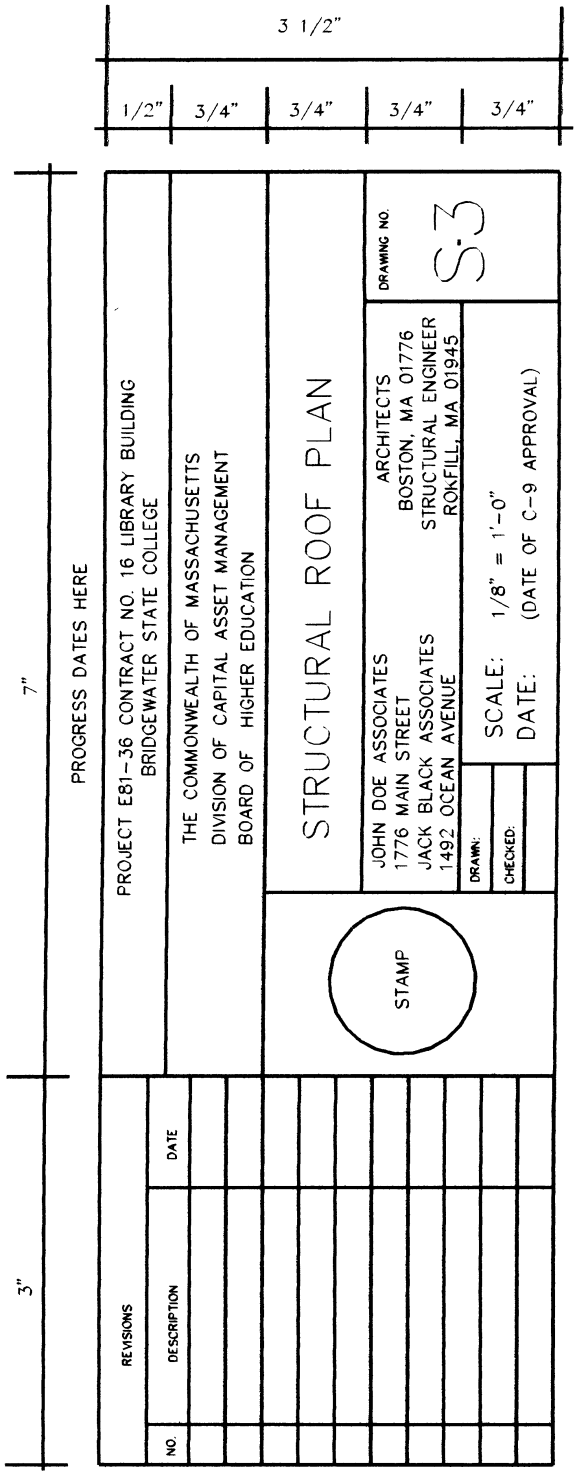
APPENDIX E - Sample Drawing Layout



APPENDIX F– Sample Title Sheet



APPENDIX G—Sample Title Box



The title box shall appear on all drawings. The Designer's name shall appear on all drawings. The name of the Consulting Engineer (ie, Structural, Plumbing, Heating and Ventilating, Electrical, or other consultant shall appear on the drawings he/she prepares. The Architect or Engineer who prepares a particular plan shall affix his/her stamp and signature to that drawing. The date on Design Development drawings shall be the date of the submission to DCAM. The date on the construction Drawings shall be the date of DCAM final approval (Step C-9).

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APPENDIX H

SAMPLE UNIT PRICE
(GENERAL CONTRACTOR'S WORK)
PROPOSAL SHEET

[Note to Designer: submit this sheet loose with specification]

MASSACHUSETTS STATE PROJECT NO. CONTRACT NO.

(project title)
(institution)
(Location)

UNIT PRICES

A. The following unit prices as defined in the specifications are designated for items of work on the basis of quantities estimated by the Designer. These unit prices will be used to add to or deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount.

SECT.	ITEM	ESTIMATED QUANTITY	UNIT MEASURE	UNIT PRICE DOLLARS/CENTS	TOTAL AMOUNT DOLLARS/CENTS
	Ledge or rock open cut		Cubic Yard	$ _____	$ _____
	Ledge or rock trench cut		Cubic Yard	$ _____	$ _____
	Ledge or rock by hand method		Cubic Yard	$ _____	$ _____
				TOTAL	$ _____

B. The unit prices as requested herein shall include their pro-rata share of all costs for overhead, profit, bond, labor, materials and equipment costs for the blasting, excavation and all other work incidental thereto, including disposal of rock material.

C. Any unit price proposal that contains a unit price which is unduly high or low may be rejected as unbalanced, and thereby affect the total cost proposal of this contract.

D. The total amount above shall be included in the amount to be entered in Paragraph D Item 1 - Work of the General Contractor.

APPENDIX Ha

SAMPLE UNIT PRICE (FILED SUB-BID WORK) PROPOSAL SHEET

[Note to Designer: submit this sheet loose with specification]

MASSACHUSETTS STATE PROJECT NO. CONTRACT NO.

(project title)
(institution)
(location)

UNIT PRICES

A. The following unit prices as defined in the specifications are designated for items of work on the basis of quantities estimated by the Designer. These unit prices will be used to add to or deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount.

SECT.	ITEM	ESTIMATED QUANTITY	UNIT MEASURE	UNIT PRICE DOLLARS/CENTS	TOTAL AMOUNT DOLLARS/CENTS
	8" CMU Wall 8'-0" high		Linear foot	$ _____	$ _____
	6" CMU Wall 8'-0" high		Linear foot	$ _____	$ _____
	4" CMU Wall 8'-0" high		Linear foot	$ _____	$ _____
				TOTAL	$ _____

B. The unit prices as requested herein shall include their pro-rata share of all costs for overhead, profit, bond, labor, materials and equipment costs and all other work incidental thereto.

C. Any unit price proposal that contains a unit price which is unduly high or low may be rejected as unbalanced, and thereby affect the total cost proposal of this contract.

D. The total amount above must be submitted with the filed sub-bid form.

APPENDIX I

SAMPLE ALTERNATE PROPOSAL SHEET

MASSACHUSETTS STATE PROJECT NO. CONTRACT NO.

(project title)
(institution)
(location)

ALTERNATE NO. (1)

If Alternate No. (1),
as described in paragraph _____ of Section _____ is accepted by the Commonwealth, the proposed contract price shall be revised as follows:

ITEM 1. Work of the General Contractor:
(being all work other than that covered by Item 2) ADD $ _____

ITEM 2. Sub-Bids:

Section	Sub-Division	**Name of Sub-Bidder	ADD	*Bond Required YES or NO
	(Electrical)	_____	$_____	_____

TOTAL ALTERNATE PRICE:
Sum of items 1 and 41, above ADD $ _____
(Enter in Paragraph C, Page E
as Alternate No. (1) price)

*Failure to fill in any or all spaces in this column will be construed as entry of the word "NO."

**The General Contractor shall use the same Sub-Bidders for all alternates that were selected for the base bid.

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APPENDIX J

SAMPLE ADDENDUM SHEET

THE COMMONWEALTH OF MASSACHUSETTS

EXECUTIVE OFFICE FOR ADMINISTRATION AND FINANCE

DIVISION OF CAPITAL ASSET MANAGEMENT

OFFICE OF _____

Massachusetts State Project Contract No.

(project title)
(institution)
(location)

ADDENDUM NO. 1
(date)

The attention of bidders submitting proposals for the subject project at (fill in Institution and Location) is called to the following addendum to the (Designer to include here only the applicable item or items such as contract, specifications and/or drawings.) The items set forth herein, whether of omission, addition, substitution or clarification are all to be included in and form a part of the proposal submitted.

THE NUMBER OF THIS ADDENDUM (NO. 1) MUST BE ENTERED IN THE APPROPRIATE SPACE B, PROVIDED AFTER THE WORD "NUMBERED" ON PAGE E OF THE CONTRACT FORM ENTITLED "FORM FOR GENERAL BID", AND IN SPACE B OF THE "FORM FOR SUB-BID."

A. -CONTRACT FORM CHANGES:

1. Notice to Contractors

Page 1 - Change in the fourth paragraph - the date of submittal bids for the General contract from August 15, 1983 to September 1, 1983.

B. SPECIFICATION CHANGES:

1. SECTION 05101 MISCELLANEOUS AND ORNAMENTAL IRON

a. Page 05101-7 Article A-5 paragraph 1. DELETE this paragraph in its entirety and substitute the following:

"Units shall have one-piece steel frame heliarc welded, polished, baked matte block finish with no open miters"

APPENDIX J (continued)

SAMPLE ADDENDUM SHEET

C. DRAWING CHANGES:

1. DRAWING A-14
   a. Detail 13
   Change 8 ft. - 0 in. dimension for elevator door opening to 7 ft. - 0 in.

END OF ADDENDUM #1

_____ Director,
Office of _____

2 of 2

[Note to Designer: The Estimator's "takeoff work- sheets" shall be submitted for the Schematic Phase, the Design Development Phase and the Construction Document Phase. The work sheets sball include the unit measure, material cost, labor cost, equipment cost, bare total cost and total cost incorporating overhead and profit for each item of work contained in each Section of the Specifications. The Estimator may use the format established by R. S. Means Company, Inc. at its discretion.

APPENDIX "K" DCAM Estimate Summary Sheets 1 of 2" and 2 of 2 shall be completed by the Designer and shall be submitted with the estimate in each phase of the design.]

APPENDIX K

DCAM ESTIMATE SUMMARY SHEET

MASS. STATE PROJECT NO. _____ CONTRACT NO._____

_____

TITLE AND LOCATION OF PROJECT

_____ _____ _____

DESIGNER ESTIMATOR DATE SUBMITTED

_____ _____

CONSTRUCTION DURATION ANTICIPATED BID DATE

	Base Bid	Alternates 1	2	3
1. SITE COST	$ _____			
2. BUILDING COST	$ _____			
3. ESTIMATED BID COST (INCLUDE OVERHEAD AND PROFIT)	$ _____	___	___	___
4. ITEM 1 WORK OF GENERAL CONTRACTOR	$ _____	___	___	___
5. ITEM 2 WORK OF FILED SUB-BIDS -- TOTALED	$ _____	___	___	___
6. GROSS SQ. FT. AREA OF BUILDING	$ _____			
7. GROSS SQ. FT. COST OF BUILDING	$ _____			
8. NET SQ. FT. AREA OF BUILDING	$ _____			
9. ET TO *GROSS* SQ. FOOTAGE _____ %				
10. UNIT USER COST (PUPIL, BED)	$ _____			
11. GENERAL CONTRACTOR'S OVERHEAD AND PROFIT	$ _____	___	___	___

[Note to Designer: If alternates are used, line numbers 3,4,5 & 11 shall be filled in for each alternate.]

SHEET I OF 2

APPENDIX K (continued)

FIELD SUB-BIDS BY SECTION

		BASE BID	ALTERNATES		
			1	2	3
04101	MASONRY	$			
05101	MISC. & ORN. IRON	$			
07101	WPFG., DAMP. & CAULKING	$			
07201	ROOFING & FLASHING	$			
08501,	METAL WINDOWS	$			
08801	GLASS & GLAZING	$			
09201	LATHING & PLASTERING	$			
09301	TILE	$			
09401	TERRAZZO	$			
09501	ACOUSTICAL TILE	$			
09601	MARBLE	$			
09701	RESILIENT FLOORS	$			
09901	PAINTING	$			
14201	ELEVATORS	$			
15301	FIRE PROTECTION	$			
15401	PLUMBING	$			
15501	HVAC	$			
16101	ELECTRICAL WORK	$			
	TOTAL OF ITEM 2 WORK	$_____	$_____	$_____	$_____

BREAK-OUT OF SUB-SUB-BIDS

PLUMBING: INSULATION	$_____
(OTHER)	$_____
HVAC: TEMPERATURE CONTROLS	$_____
SHEET METAL	$_____
INSULATION	$_____
BALANCING	$_____
ELECTRICAL: -- SYSTEM	$_____
(OTHER)	$_____

SHEET 2 OF 2

APPENDIX L
SAMPLE

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

[Note to Designer: Edit the following articles as required]

1.02 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment to complete the work of this Section including, but not limited to, the following:

1. Furnishing and installing all finish hardware as specified and scheduled. Responsibility for fabrication, delivery, receiving, checking, storing shipments and installations shall be borne by the General Contractor.

2. Furnish all necessary templates and schedules required to fabricate doors, frames, thresholds and all work incidental thereto.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. SECTION 05500 - HAND RAIL BRACKETS AND RETURNS

2. SECTION 08100 - METAL DOORS AND FRAMES

3. SECTION 08400 - METAL THRESHOLDS THAT ARE PART OF A DOOR SYSTEM

4. SECTION 10800 - TOILET ROOM ACCESSORIES

5. Hardware for the following items are not included:
   a. Metal casework.

   b. Elevator doors, except where required to be master-keyed.

   c. Steel windows.

   d. Wire partitions (except cylinders).

   e. Toilet partition doors.

1.03 QUALITY CONTROL

A. Lock fronts, flush bolt faces, and strikes shall be beveled, rounded, or rabbeted as required by the contract drawings. The General Contractor shall determine and be responsible for the hand and bevel of all doors.

B. For additional Quality Control items, refer to SECTION 01400 QUALITY CONTROL.

1.04 REFERENCES

A. Hardware shall comply with the requirements of the following references. American National Standards Institute (ANSI) numbers are specified for hardware items except when only Builders Hardware Manufacturers Association (B.H.M.A.) numbers are available.

A.N.S.I.	156.1	Butts and Hinges (Grade 1)
A.N.S.I.	156.2	Locks and Lock trim (Grade 1)
A.N.S.I.	156.3	Exit Devices (Grade 1)
A.N.S.I.	156.4	Door Controls -- Closers
A.N.S.I.	156.6	Architectural Door Trim
A.N.S.I.	156.7	Template Hinge Dimensions
A.N.S.I.	156.8	Door Controls -- Overhead Holders
B.H.M.A	1301	Materials and Finishes
B.H.M.A	1201	Auxiliary Hardware
B.H.M.A	1101	Spring Hinges

[Note to Designer: Items not covered by ANSI or BHNA Standards to be specified herein shall include the names of at least 3 quality manufacturers and their catalog numbers for each item.]

[Note to Designer: Most User Agencies use specific door and lock hardware, contact User Agency to determine preference]

1.05 SUBMITTALS

A. Schedules

1. Four (4) complete schedules shall be submitted to the Designer for approval within 21 days after written notice of the award of the contract has been forwarded to the General Contractor, giving the manufacturers' numbers, sizes and installation location for all hardware required to complete the project. The schedule indicates the type and quality of hardware desired and is designated by ANSI or BHMA Standard numbers.

B. Samples

1. A complete line of samples shall be submitted to the Designer for approval when requested. Samples shall be plainly marked with the number indicated in the Specifications, the manufacturers' numbers, types and sizes. Approved samples shall remain with the Designer until delivery of all hardware to the project site is completed; then they will be incorporated in the work.

C. Refer to SECTION 01300 SUBMITTALS for additional information.

1.06 DELIVERY STORAGE AND HANDLING

A. All packages shall be legibly labeled indicating manufacturers' numbers, types, sizes, and hardware schedule reference numbers. All hardware shall be protectively wrapped and shall be packed in the same package as all screws, bolts, and fastenings necessary for proper installations.

B. Refer to SECTION 01600 MATERIAL AND EQUIPMENT for additional information.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All hardware shall be best grade, entirely free from imperfections in manufacture and finish. Qualities, weights and sizes specified herein are the minimum that will be accepted.

[Note to the Designer: Insert necessary additional items and information to the following. Hardware complying with the requirements of ANSI and BHHA Standards shall be specified. Determine and specify the proper hardware for each project. Mounting heights for all hardware shall be specified to meet physical handicapped requirements where necessary.]

B. Hinges

1. Number of hinges or pivots per door:
[Designer shall fill in]

2. Hinges shall be:
[Designer shall fill in hinge types and include specific requirements]

3. Hinges shall be sized as follows:

exterior doors.....

interior doors.....
[Designer shall fill in]

4. Hinges or pivots for exterior or interior doors requiring security shall have non-removable pins.

C. Locksets and latchsets shall consist of the following: They shall by the type_____ with functions as detailed hereinafter. Strikes shall be furnished with wrought bronze boxes. Lockset and latchset trim design shall be_____.
[Note to Designer: Choose from the basic lock types shown in the ANSI Standards; i.e. Mortise, Pre-assembled or Bore-in.]

D. Door closers
[Note to Designer: Refer to the various types and applications noted in ANSI Standards. General considerations shall be the avoidance of mounting door closers on the exterior of the

buildings, and to mounting closers on that side of an opening that is least exposed to public view, through bolt all closers to door].

E. Push plate shall be type_____ Pulls shall be type _____.
[Note to Designer: Due to the large selection available on the above items, select those combinations most compatible. Push plates shall be specified six to eight inches wide, door style permitting, with a height of approximately sixteen inches.]

F. Kick plates shall be type _____. Size 8 inches high x 2 inches less width of single doors and 1 inch less width of each double door, beveled three sides.

G. Armor plates shall be type _____ , height _____, with width 2 inches less width of single doors and 1 inch less width of double doors.

H. Door stops shall be type _____.
[Note to Designer: Furnish and install a stop or holder for each door and each leaf for a pair of doors. Wall stops shall be furnished wherever possible. Floor stops may be supplied where wall stops cannot be used. Where neither wall stops or floor stops are applicable overhead stays shall be furnished.]

1. Floor stop heights shall be commensurate with special conditions, such as undercut doors and thresholds. Where carpet occurs and a floor stop is required, a base riser shall be supplied. Floor stops, if required, shall be cast bronze or brass and shall be attached by means of tampin shields and stainless steel flathead machine screws.

2. Wall stops shall be cast bronze or brass and furnished with proper attachment for wall conditions. overhead stays shall be surface-type with heavy extruded bronze or brass channel, secured to the door with flush dual-head hex nuts and slotted oval-head thru-bolts, unless otherwise specified. *[Note to Designer: List here the numbers as shown in the ANSI Standard for this project application.]*

I. Exit devices shall be type _____ . *[Note to Designer: Select from ANSI Standard the types required for this project. Note that approval of exit devices is done for two separate requirements, i.e. Fire Door listing and Casualty listing. Either or both may be required.]*

J. Flush bolts shall be type _____.

K. Door holders shall be type _____.
[Note to Designer: Select from the ANSI Standards the type or types that are necessary for adequate performance.]

L. Silencers shall be type _____. Furnish (3) for each single door and (2) for each double door.

M. Key Cabinets shall be _____.
[Note to Designer: Insert quantity, type, capacity and locations of cabinets. Provide for furnishing and installations of all cabinets including keys affixed to books, and file cards filled out according to the keying instructions.]

N. *[Note to Designer: Specify here any other types of hardware or systems required, i.e. Electric or Electronic Hardware, Gasketing or Weatherstripping, Removable Mullions, Special Security Devices.]*

2.02 KEYING

A. Keying System:

[Note to Designer: Grand Master Keying System,]faster Keying Systems and/or Sub-Master Keying Systems shall be specified after consulting with the User Agency regarding type of system to be furnished.]

B. Furnish temporary construction cylinders with keys.

C. Furnish the following quantity of keys:

1. Grand Master Keys

2. Master Keys

3. Sub-Master Keys

4. Control Keys

5. Keys for each cylinder or keyed alike set.

2.03 FINISHES

[Note to Designer: Fill in required finishes for all hardware items ***based*** on ***BHMA*** Standard numbers.]

A. Hinges:

B. Locksets:

C. Push or pull plates:

D. Kick plates:

E. Door closers:

F. Door stops:

2.04 TEMPLATES

A. All necessary templates and approved schedules required to fabricate doors, frames, and thresholds shall be furnished in sufficient time so as not to impede the progress of the work.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Finish Hardware Schedules

[Note to *Designer: Include the following information in approximately the following arrangement. If there is* a *large quantity of doors in the project, omit the door numbers from the Specifications but only if the* Hardware *number* is *indicated adjacent to* each *door number on the door schedule. All doors shall be numbered. Hardware shall be explicitly specified by quantity, type and size.]*

[Item Number]

[Single or pair] [Door location - room to room] [Door number as on plans]
[Quantity] [Hardware item] [Type]

EXAMPLES

HW set 1

pair of doors - "B" label Corridor from Mechanical Room - Door Numbers 101, 201, 301, 401, and 501

3	Pair hinges	A8l4l
1	Lock	F07 Grade 2
2	Closers	C01181
2	Flush bolts	L14201
2	Stops	L12031
2	Silencers	L03011
1	Threshold	J600 Aluminum-Corrugated

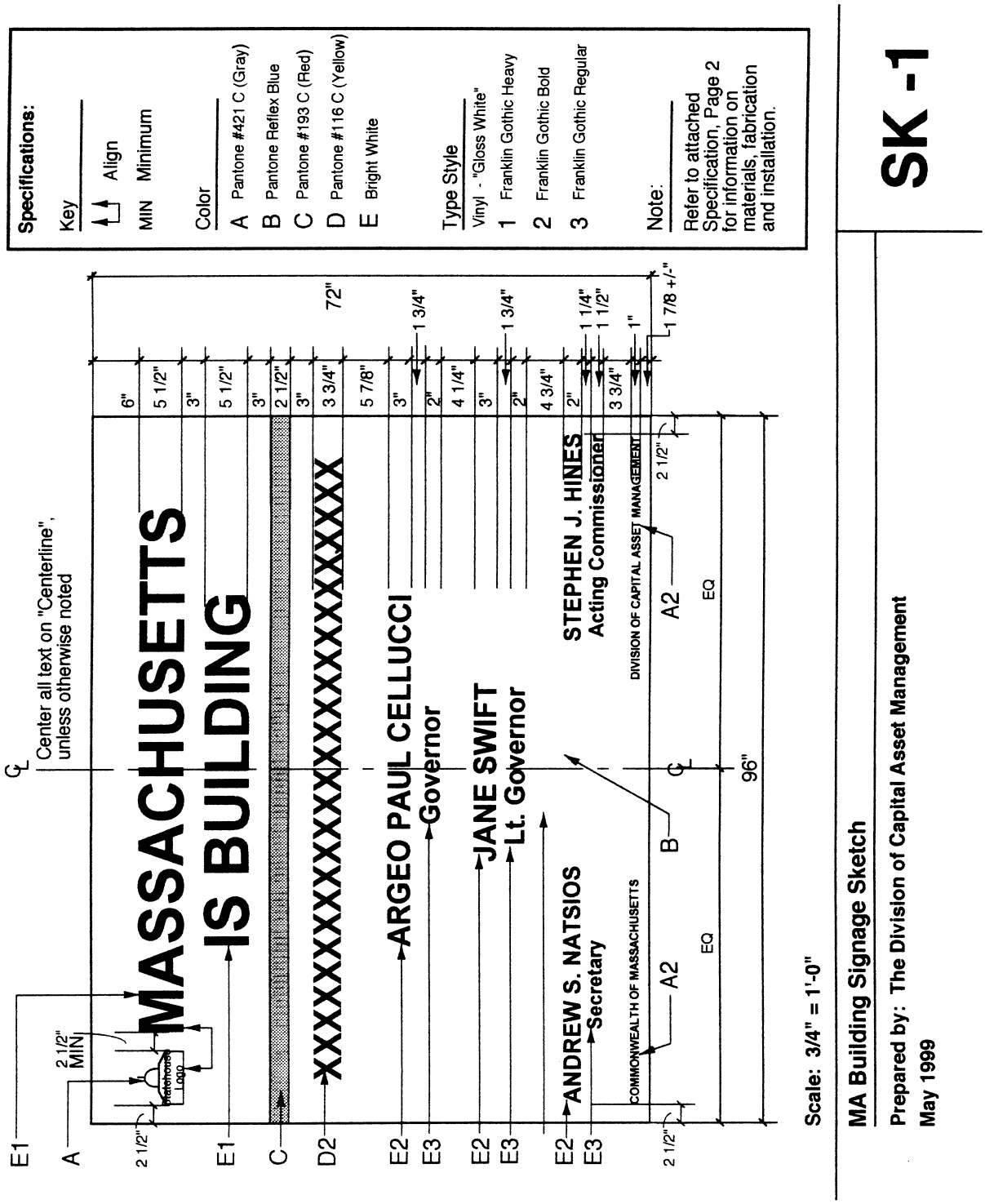
HW set 2

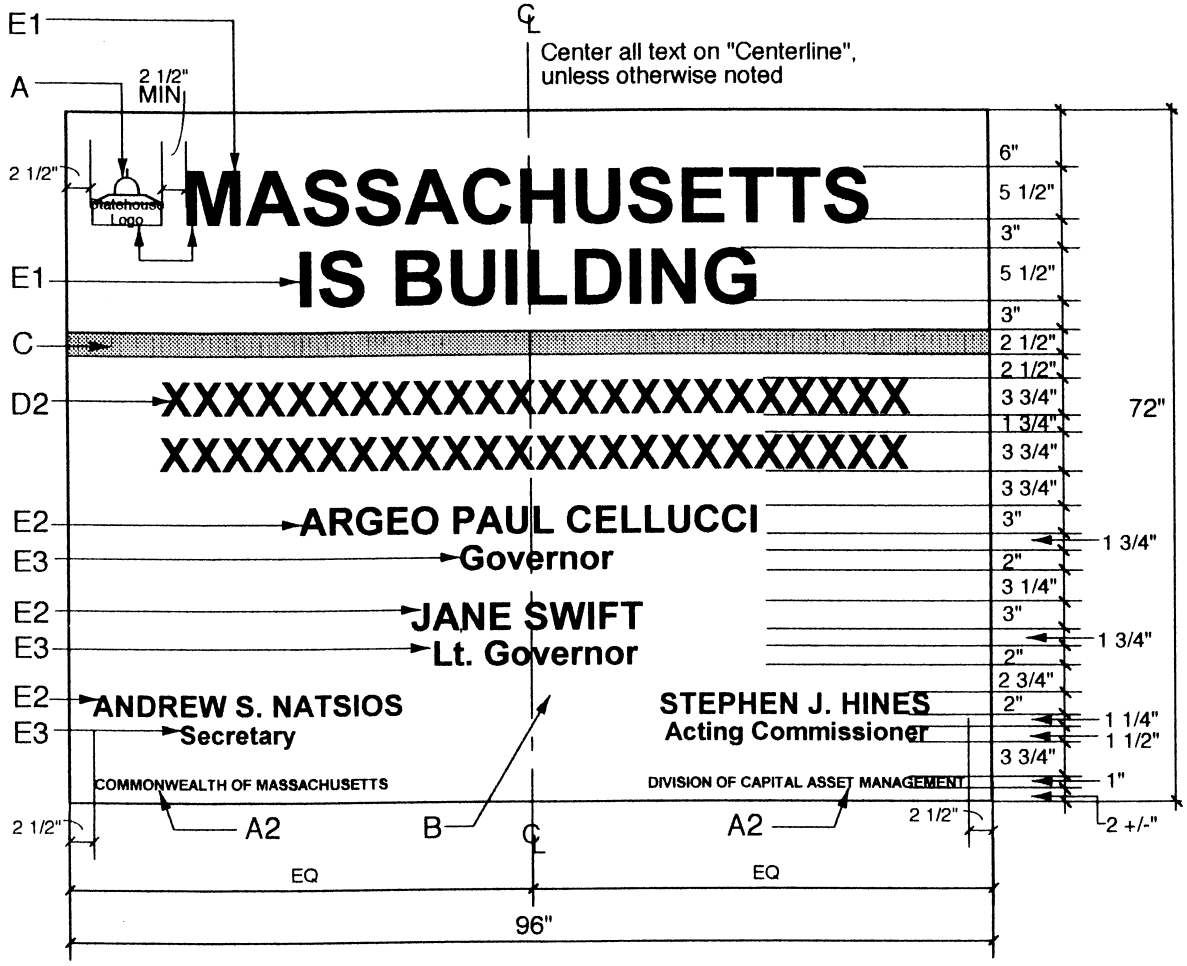
single doors - "C" label Corridor to Classrooms -- Door Numbers 103, 104, 105, 203,204,205,303, 304,305

1	1/2 Fair hinges	k8i42
1	Lock	F05 Grade 1
1	Closer	C02121
1	lick plate	J100 - Stainless Steel
1	Stop	L12071
3	Silencers	L03011

END OF SECTION

APPENDIX M
Sample Construction Sign





Specifications:

Key

Align

MIN Minimum

Color

A Pantone #421 C (Gray)

B Pantone Reflex Blue

C Pantone #193 C (Red)

D Pantone #116 C (Yellow)

E Bright White

Type Style

Vinyl - "Gloss White"

1 Franklin Gothic Heavy

2 Franklin Gothic Bold

3 Franklin Gothic Regular

Note:

Refer to attached Specification, Page 2 for information on materials, fabrication and installation.

Scale: 3/4" = 1'-0"

MA Building Signage Sketch - (Two Line Project Name)

Prepared by: The Division of Capital Asset Management

May 1999

SK -2

APPENDIX N
Sustainable Design Elements

The following specifications should be adopted by the designer in addition to the preceding material. Where a specification cannot be met, the designer shall justify the need for the exception to any specific design element. Designers shall ensure that specifications can be met by three manufacturers.

This appendix contains the following sections:

Section 1: Requirements by division
Section 2: Process for maximizing utility rebates for conservation measures
Section 3: Compliance with Massachusetts Energy Code
Section 4: Indoor Air Quality Considerations
Section 5: Description of Life Cycle Cost Analysis

Section 1: Requirements by Division

Divison 2: Site Work

02810 Irrigation Systems	• Equip irrigation systems with rain sensor overrides. • Avoid line pressure misting sprinklers where possible. • Consider submetering irrigation. • Consider capturing rainwater or greywater for irrigation.
02900 Landscape work	• Use plants native to the site in order to reduce the need for soil amendments and excessive water. • Minimize use of annuals or lawns.

Division 3: Concrete

03300 and 03400 Cast-In-Place Concrete and Precast Concrete	• Where removable formwork is used, specify a biodegradable form release agent. • Specify curing compounds that have less than 160 grams/liter VOCs. • Consider concrete with fly ash content.

Division 5: Metals

Steel and aluminum	• Specify steel and aluminum with recycled content of 30% or greater or justify the alternative.

Division 6: Wood & Plastic

Fences, decks, and benches	• Specify recycled plastic with a minimum of 50% recycled content or wood-recycled plastic composite products or justify the alternatives.
Treated wood	• Do not specify wood treated with copper chromium arsenate.
06100 Rough carpentry	• Specify composite boards without urea-formaldehyde binding resins. • Specify structural fiberboard with a minimum of 85% post-consumer waste material or justify alternative.
06400 Architectural woodwork	• Do not use endangered wood species as defined by the Convention on International Trade in Endangered Species (CITES) current list of internationally restricted endangered timber species. • Specify water-based adhesives and low-VOC adhesives where ever possible. • Specify wood finishes according to Section 09930.
06500 Structural Plastics	• Consider using recycled plastic lumber for exterior decking, fencing, parking appurtenances, and outdoor site furnishings.

Division 7 - Thermal and

Moisture Protection

07200
Building Insulation

- Specify insulation materials without ozone depeleting compounds.
- Specify insulation with at least 20% recycled material by weight.

07900
Joint Sealants

- Specify low-VOC sealants. For acrylic latex and/or silicone sealants specify products having less than 50 grams/liter VOCs. For polyurethanes, specify products with less than 100 grams/liter VOCs.

Specify that sealants shall not be formulated with aromatic solvents (organic solvents with a benzene ring in their molecular structure), halogenated solvents, fibrous talc or asbestos, formaldehyde, mercury, lead, cadmium, hexavalent chromium, or their compounds.

Division 8 - Doors and Windows

08200
Wood doors

- Specify wood doors with core materials that do not contain particleboard made with urea-formaldehyde binders.
- Specify low-VOC stains and transparent finishes (see Division 9).
- Consider wood doors made with sustainably harvested or certified wood.

08800
Glass and glazing

- Use low-e glazing

Division 9 - Finishes

09200
Lath and Plaster

- Specify plaster with no-VOC-emitting additives, such as epoxy or other resins.

09250
Gypsum Drywall Construction

- Specify drywall with facing paper from 100% recycled newsprint, if available or justify the alternative.
- When sound attenuation insulation is used in gypsum construction, specify that it be completely encapsulated within partitions and does not occur where particulate matter can enter return air plenums or other recirculation channels.
- Specify the installation of gypsum board with screws rather than laminating with adhesives.
- Specify paper joint tape rather than fiberglass tape.

Specify joint compound that is zero- or low-VOC (less than 20 grams/liter).

09510
Acoustic Panel Ceiling

- Specify acoustic panel with a maximum recycled content or justify alternatives.
- Specify ceiling tile products that are free from formaldehyde.

Do not specify vinyl-faced ceiling tiles.

09640
Wood Flooring

- Specify floor coatings that have less than 300 grams/liter VOCs.
- Specify water-based flooring adhesives with less than 100 grams/liter VOCs.
- Consider wood from certified sources.

09650
Resilient Flooring

- Specify low-VOC (less than 100 grams/liter) adhesives).
- Consider low-emission resilient flooring such as cork.

Consider flooring made from recycled materials such as rubber (90% post consumer material), vinyl tiles.

09680
Carpet

- If possible, specify that carpet have the Carpet and Rug Institute IAQ Testing Program logo.
- Specify that carpet be aired out at the warehouse for at lease seven (7) days prior to installation at the facility.
- Avoid carpets with backing made from vinyl., styrene butadiene latex which is a primary emitter of 4-phenylcyclophexene (4-PC).
- Specify carpet with recycled backing.
- Specify carpet with low VOCs.
- Specify Entry Carpet Matting with recycled rubber.
- Specify Food Service Matting with recycled rubber
- Specify low- or no-VOC adhesives (less than 50 grams/liter).
- Keep carpet away from entrance-ways to avoid moisture and dirt build-up.

09720

- Avoid the use of vinyl wall coverings. Consider the use of natural wall coverings

Wall Coverings	such as sisal, jute, or cork. • Specify only water-based adhesives having no more than 50 grams/liter VOCs
09840 Acoustical Wall Panels	• Avoid vinyl-faced acoustical wall panels. • Specify wall panels that are manufactured without formaldehyde. • Consider panels with high recycled content. • Specify installation methods that do not use adhesives.
09910 Paint	• For general interior and exterior applications, use water-based, zero- or low-VOC (less than 10 grams/liter for interior paints, less than 50 grams/liter for exterior) latex paints and primers. • Specify that water-based paints must not be formulated with aromatic hydrocarbons (organic solvents with a benzene ring in its molecular strubut), formaldeyde, halogenated solvents, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI, antimony and their oxides. • Specify that paints shall be formulated without methylene chloride, tolulene, ethyl benzene, vinyl Chloride, naphthalene, 1,2-dichlorobenzene, pthalates, isophoron, 1,1,1-trichloroethane, methyl ethyl keton, methyl isobutyl ketone, acrolein, acrylo-nitrile and ethylene glycol, all of which pose varying threats to human health. • Where solvent-based paints, high performance acrylic coatings, pigmented acrylic sealers, or epoxy coatings are necessary, specify VOC levels less than 250 grams/liter.

09930
Stains and Varnishes
	• Use water-based stains and transparent finishes. Consider using natural stains and varnishes which are made without the use of petrochemical products.
	• Specify low VOC products:
	  • stains – less than 200 grams/liter
	  • transparent finishes -- less than 250 grams/liter
	  • floor coating – less than 300 grams/liter

09970 Coating for Steel	• Specify rust-inhibiting metal primer that has less than 250 grams/liter VOCs and is free of most of the hazardous chemicals listed for paints.
09980 Coatings for Concrete	• Specify water-based penetrating concrete sealer than has less than 100 grams/liter VOCs and is free of most of the hazardous chemicals listed for paint.
Division 10 - Specialties	
10160 Toilet Compartments	• Consider solid plastic toilet compartments fabricated from recycled high density polyethylene.
Division 11 - Equipment	
11450 Appliances	• Specify energy efficient and water saving appliances • Specify Energy Star appliances in the size categories in which Energy Star ratings apply.
Division 12 Furnishings	
Division 13 - Special Construction	
Ice Skating Rinks	• Ice Skating Rinks shall be designed with maximum energy efficiency including but not limited to: low-e ceiling premium efficient motors heat exchangers • Designers of pools at educational facilities must comply with MGL Ch 164 331 (as amended) that requires the Division of Capital Asset Management to evaluate the use of solar or other renewable energy systems as the primary energy source for hot water. • Pool design should include a pool cover system.

Educational facilities	• Designers of educational facilities with a demand for hot water in excess of 1000 gallons per day must comply with MGL Ch 164 331 (as amended) that requires the Division of Capital Asset Management to evaluate the use of solar or other renewable energy systems as the primary energy source for hot water.
Laboratories	• Evaluate fume hood controls and associated variable air volume systems for laboratories.
Division 14 - Conveying Systems	
14200 Elevators	• Consider using high-speed elevators with AC variable frequency drives. • Evaluate the use of closed dampers in elevator shafts to prevent heat loss. • Evaluate elevator shaft as a source of radon.
Division 15 - Mechanical	
15400 Plumbing	• Public toilet room sink fixtures shall not exceed 0.5 GPM at 80 PSI. • Showerhead fixtures shall be of low flow type, maximum 2.5 GPM @ 80 PSI. • All new toilets shall be a maximum 1.6 GPF. Existing toilets should be retrofit with Sloan Valve Retrofit Kits wherever possible. • Consider infrared sensors. • Consider the use of waterless urinals.
HVAC	• Specify high efficiency heating and cooling equipment, pumps, and motors. • Specify variable frequency drives when ever possible. • Install heat exchanger systems when ever possible. Consider air to air or dessicant heat exchangers. • Consider the Federal Energy Management Program standards for Air Conditioners as a minimum. • Consider direct digital control energy management and control systems. • Consider alternatives to the use of HCFCs. • Design cooling towers with delimiters to reduce drift and evaporation. • Consider specifying that HVAC duct work is delivered to the site with caps and that these caps are replaced each night. • Include CO2 or other occupancy sensors in rooms with intermittent or highly variable occupancy levels.
Division 16 - Electrical	
16500 Lighting	<u>Interior lighting</u> • Specify fluorescent rather than incandescent lighting. • Specify combinations for T-5, T-8, compact fluorescents, and electronic ballasts. • Maximize the integration of daylighting through the use of vertical fenestration, light shelves, clerestories/monitors, and the building form as well as through transparent interior partitions. • Maximize the use of daylighting through the use of photosensors and dimmable ballasts. • Use occupancy sensors and multi-switching where ever possible. • Target lighting power density in offices should be 1 Watt/square foot or less. • When HID lights are use consider 2 stage switching. <u>Exterior lighting</u> • Specify metal halide or high pressure sodium lamps for general purpose exterior lighting. • Consider solar-powered exterior lighting • Equip exterior lighting with photosensors. • Minimize light overlap.

	Emergency lighting • Specify LED (Light-emitting diode) exit signs.
Motors	• Specify premium efficient motors where ever possible

Section 2: Process for maximizing utility rebates for conservation measures

The electric and gas utility companies offer demand side management (DSM) to help customers design and install energy efficient equipment. (Some companies phased out programs, but are now ramping them up.) The DSM programs offer rebates to customers as incentives to increase efficiency. Each utility offers a different program.

In general projects can receive DSM rebates for the following types of efficiency measures in renovations and new construction:

Electric	Gas
Efficient lighting	Switching to gas from another fuel
Efficient heating (not likely)	Efficient heating
Efficient air conditioning	Efficient air conditioning
Oversized cooling towers	
Ground source heat pumps	
Window glazing to reduce cooling load	
Premium efficient motors	
Variable speed drives	
Variable air volume systems	
Fume hood controls	

In addition, the utilities often can offer design assistance to help design efficient systems. (This usually applies to larger projects.)

The design team should be expected to help Asset Management participate in the utility demand side management programs.

To ensure that eligible rebates are collected, include the Energy Team in the B-conference meeting to:

1) determine if utility rebates apply
2) determine the schedule for design to meet prescriptive rebate requirements and/or to participate in custom design programs

The DCAM Energy Team can help the project manager and the design team to make contact with the utilities and ensure that necessary paperwork is completed by the appropriate parties.

Section 3: Compliance with Massachusetts Energy Code

The Designer is responsible for documenting that all aspects of the project design meet or exceed the Massachusetts Energy Conservation Building Code including but not limited to utilizing compliance software.

Section 4: Indoor Environment Quality Considerations

The Designer shall take all possible steps to ensure that the building's indoor environment (including, but not limited to air quality) is safe and healthy.

Emissions rates of designated materials shall be obtained from information available from the manufacturer and from Material Safety Data Sheets.

The following is a summary of the maximum emitable VOC rates as determined by ASTM D 3960-2 specified in Section 1 above:

Material	Maximum VOCs grams/liter

Concrete curing compound		160
Joint Sealants - acrylic or silicone	50	
Polyurethanes		100
Adhesives		100
Paint -interior		10
Paint - exterior		50
Paint - solvent based		250
Stains		200
Transparent finishes		250
Floor coating		300
Rust inhibiting primer		250
Concrete sealer		100
Joint compound		20

Designers shall ensure that at least three manufacturers can meet any specification.

Section 5: Description of Life Cycle Cost Analysis (LCC)

LCC estimates the true cost of a building, or its components over its anticipated lifetime. LCC includes not only the initial capital cost, but also operation and maintenance costs calculated in present value.

MGL Ch. 149 Section 44m and MGL Ch. 164 Section 331 require the Division of Asset Management to consider the life-cycle cost (LCC) of implementing energy efficient and water conserving technologies, including the use of renewable fuels, in new construction or major renovation projects. This LCC analysis will evaluate building components that can have a bearing on energy use and resource efficiency, including, but not limited to building envelope, HVAC systems, heat recovery systems, variable speed drives, variable air volume systems, lighting, controls, and sustainable building materials.

The design team will be expected to undertake life cycle cost analysis (LCC) to justify design decisions.

The study team will identify appropriate measures that warrant LCC. Absent this designation in the study, the energy team will identify the measures soon after the B-conference.

The list of measures for which LCC will be performed may be revised by the design team and Asset Management.

LCC will include the elements shown in Table I below. Results of the LCC will be discussed by the design team and Asset Management in determining the final design.

Table I **Division of Capital Asset Management Life Cycle Cost Worksheet**
Complete for each measure to be evaluated.

Building profile: type, utilities, square footage, etc.
Measure:
Assumptions:
Cost of fuel: Asset Management and the facility can provide
Energy Escalation rate: 4% / year

	Option A	Option B	Option C
Description of option equipment size of equipment fuel source efficiency other			
Hours of operations annual seasonal variability			
Initial cost (equipment, additional design, associated costs)			
Utility rebates (show calculations)			
Energy use: amount/year (show calc.)			
Energy Costs: years 1-10 by year including the escalation rate			
Training cost (initial and ongoing)			
Maintenance costs: years 1-10 by year including escalation rate (contract vs. in-house – give source)			
Net cost/year by year for years 1-10 (exclude disposal cost/salvage value, below)			
Equipment life (years)			
Estimated disposal cost/salvage value in present $$			
Environmental considerations (e.g., air quality, waste, permits, certifications required etc.)			
Other (positive and negative) factors to be considered (e.g., impact on interior space)			

APPENDIX O
Environmental Issues

1. INTRODUCTION

The Commonwealth often constructs buildings and other structures in urban settings that have been impacted by past operations and practices. These operations and practices may include the use of coal as fuel in heating, the discarding of spent liquid materials in dry wells, and the on-site disposal of sludges, tank bottoms, and off-spec materials in naturally-occurring or excavated depressions. Due to the significant increased costs and possible delays that these issues may have on project budgets and schedules, respectively, DCAM has prepared this Appendix to provide Designers with the following information:

a) Types of projects that require adherence to these requirements
b) Description of Designer responsibilities
c) List of relevant DEP or other agency Guidance documents
d) Suggested specification language to address environmental issues

2. PROJECT TYPES

The types of projects that require adherence to these requirements are those for which the potential for contaminated soils, fill, sediment, groundwater, surface water, or container residues to be encountered during the proposed construction. These would include the following:

- Any building project in urban settings;
- Assessment, investigation, and design of closure options at solid waste facilities;
- Assessment, investigation, and design of remediation at sites regulated under M.G.L. c. 21E and the Massachusetts Contingency Plan (310 CMR 40.0000)
- All building and structure demolitions; and
- Projects involving materials regulated under Toxic Substance Control Act (TSCA) and the Resource Conservation and Recovery Act (RCRA).[1]

It is the Designer's responsibility to confirm with DCAM that the requirements presented herein are not required for a given project.

3. DESIGNER RESPONSIBILITIES

Designers preparing

1) Designers are responsible for obtaining and following all relevant regulations, laws, and guidance documents (see Section 4 for a partial listing of applicable DEP documents).
2) Designers are responsible for ensuring that site investigation techniques, data gathering techniques, and laboratory analysis follow acceptable procedures as determined by DEP or other regulatory bodies.
3) Designers are responsible for identifying the presence of or the absence of hazardous or toxic materials including, but not limited to: asbestos, lead, PCBs, hazardous waste, petroleum-based compounds, contaminated soils, contaminated ground water, or bird/animal guano.
4) Following identification of any hazardous or toxic materials on site, final designs should reflect appropriate handling or design considerations.
5) Designers are responsible for lawful and timely disposal of any wastes derived from site investigations.

[1] Projects that would be included in the last category would include replacement or retro-filling of PCB-transformers, design of waste storage areas for spent materials at wastewater treatment plants, etc.

6) Designers shall follow the procedures laid out in the Massachusetts Contingency Plan and secure the services of an Licensed Site Professional (LSP) when required.

4. DEP REGULATIONS AND GUIDANCE DOCUMENTS

The following are a partial list of DEP regulations that the Designer should use in developing investigations and designs that may require DEP submittals. This list is current as of November 15, 1999 but the Designer is required to use the latest version of the applicable regulation. It is the Designer's responsibility to confirm that subsequent revisions has not occurred.

1. Massachusetts Contingency Plan (310 CMR 40.0000)
2. Hazardous Waste Regulations (310 CMR 30.000)
3. Solid Waste Regulations (310 CMR 19.000)

Policies and guidance documents developed by DEP to assist in implementing these regulations can be obtained from the State Bookstore and/or from applicable DEP WEB-sites. The following are some of DEP's web pages:

1. Bureau of Waste Site Cleanup http://www.magnet.state.ma.us/dep/bwsc
2. Bureau of Waste Prevention http://www.magnet.state.ma.us/dep/bwp
3. Bureau of Research and Standards http://www.magnet.state.ma.us/dep/ors

5. SUGGESTED SPECIFICATIONS

The following sections provide suggested language for the Designer to address Health and Safety requirements; and handling, storage, transportation, and disposal of contaminated materials. It is noted that these are suggested language and that the Designer is obligated to thoroughly review these suggested language sections for applicability

A. SECTION 01020 SPECIAL REQUIREMENTS

Add a New Section: Health and Safety Requirements

A. The Contractor shall prepare a Health and Safety Plan that addresses protection of employee and public health and safety. The minimum contents of the Plan are specified in Section 01300 – Submittals.

B. The Contractor shall be solely responsible for implementing the procedures specified in the Plan.

C. The Contractor shall make available complete sets of personal protective equipment and Clothing to the Division of Capital Asset Management for use during site inspections by the Division of Capital Asset Management or the Designer. These shall be supplied and maintained at no cost to the Division of Capital Asset Management or the Designer, and shall be returned to the Contractor upon completion of the Work, except for disposable protective clothing. The Contractor shall provide a repository for collection and disposal of health and safety materials. Collection and disposal of contaminated disposable supplies shall be at cost to the Contractor.

B. SECTION 01300 SUBMITTALS

Add a New Section 1.05

1.05 HEALTH AND SAFETY PLAN

A The General Contractor shall prepare a Health and Safety Plan that addresses maintaining safe working conditions relative to chemical constituents in soil, sediment, groundwater and air.

B. The locations of surface and subsurface explorations are shown on the Drawings and copies of the analytical data are included in Appendix ___. Such data is offered in good faith solely for the purpose of placing the Contractor in receipt of all information available. The Contractor shall interpret such information according to his/her judgement and the Contractor acknowledges that he/she is not relying upon the same as accurately describing the location, type, and magnitude of the chemical constituents at the site. The Contractor further acknowledges that he/she assumes all risk contingent upon the nature of chemical conditions to be actually encountered by the Contractor in performing the work covered by the contract, even though actual conditions may result in the Contractor performing more or less work than originally anticipated.

C. The Contractor shall be cognizant of the minimum standards set forth in OSHA 29 CFR 1910.120. The Health and Safety Plan shall include, but not be limited to, the following:

1. Identification of the Contractor's Site Safety Officer.

2. Identification of Contractor's Designated Field Personnel.

3. Type of Medical Surveillance Program.

4. Identification of Hazards and Risks Associated with the Project.

5. Contractor's Standards Operating Procedures, including Personnel Training and Field Orientation; Personal Hygiene Requirements and Guidelines; Field Monitoring Requirements of Site Contaminants; Respiratory Protection Training and Requirements; Levels of Protection and Selection of Equipment Procedures; Zone Delineation of the project Site; Site Security and Entry Control Procedures; Contingency and Emergency Procedures; and Listing of Emergency Contacts.

D. The Contractor shall provide the Designer with written notice of the existence of said plan and of his/her communication of said plan to all relevant workers. Work may not proceed at the Project Site until the written notice is received by the Designer.

E. The Contractor shall provide the Designer with two copies of the Health and Safety Plan for informational purposes.

C. SECTION 02150 -- CONTAMINATED MATERIAL MANAGEMENT

PART 1 GENERAL

1.1 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION

A. The Contractor shall furnish all labor, material, tools and equipment necessary for excavation, tracking, handling, stockpiling, sampling and analysis, and temporary storage of contaminated soil, and for transport and disposal of fluids and solids generated during decontamination of vehicles and personnel as part of this Work.

1.3 WORK INCLUDES

A. Excavating and shoring or bracing as necessary is part of the Work of Section 02300 - Earthwork.

B. Stockpiling and sampling of contaminated material.

C. Decontamination of equipment and vehicles and disposal of resulting liquid and solids.

D. Backfilling of excavated areas, resulting from the excavation of contaminated materials is part of the Work of Section 02300 - Earthwork.

1.4 RELATED SECTIONS

A. Section 02160 - Transportation and Disposal of Contaminated Materials.

B. Section 02200 - Site Preparation: Demolition, erosion and sedimentation control measures.

C. Section 02300 - Earthwork.

D. Others as necessary

1.5 SUBMITTALS

A. The Contractor shall submit to the Engineer a material management plan. The plan shall include:

1. Identification of proposed stockpile locations for contaminated, potentially contaminated, and potentially uncontaminated solid materials.

2. Identification of proposed storage locations for contaminated, potentially contaminated, and potentially uncontaminated liquid materials.

2. Tracking procedures for coordinating material management from placement to disposal.

B. Test results for all analytical samples shall be submitted to the Engineer. The results shall include all Chain-of-Custody forms and all documentation provided by the laboratory.

C. The Contractor shall submit to the Engineer all pertinent information relating to the decontamination water disposal or recycling facility. The facility information shall include the following:

1. General Information

a. Facility name

b. Facility address

c. Name and title of contact person

d. Telephone number of contact person

e. Permit number

2. The facility shall provide a listing of current and valid permits, licenses, letters of approval and other authorizations to operate pertaining to the receipt and management of the water specified in this contract.

D. The Contractor shall submit a decontamination water collection and disposal plan as part of the work plan described in Section 01020.

1.6 REGULATORY REQUIREMENTS

A. The Work of this Section shall be performed in accordance with all applicable Federal, State, and local regulations, laws, codes, and ordinances governing the handling, transportation, and disposal of contaminated and hazardous materials.

B. The Contractor shall obtain all necessary permits and state licenses in conjunction with contaminated materials and water, restricted material hauling and disposition. Work of this Section shall be performed in accordance with all applicable Federal, State, and local regulations, laws, codes, and ordinances governing the

1.7 DEFINITIONS

A. Decontamination Water - Water generated by the Contractor in decontaminating procedures of excavation equipment within contaminated areas.

B. Contaminated Soil - Soils or fills determined by analytical results to contain oil and/or hazardous material at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600.

C. Contaminated Groundwater - Groundwater determined by analytical results to contain any contaminants in excess of MCP reference/reportable concentrations.

E. Licensed Site Professional (LSP) - Individual certified by the Commonwealth to render opinions on the assessment and remediation of oil and hazardous material release.

1.8 QUALITY ASSURANCE

A. The Engineer's duties do not include supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Engineer nor any observation and testing by the Engineer shall excuse the Contractor from defects discovered in his Work.

PART 2 PRODUCTS

2.1 GENERAL

A. The Contractor shall provide all employees and Subcontractor(s) with personal protective equipment and protective clothing consistent with the levels of protection for this Work as indicated in the Contractor's Site Health and Safety Plan.

2.2 STORAGE OF EXCAVATED MATERIALS

A. Excavated contaminated materials shall be stockpiled on-site in accordance with the most recent version of MADEP guidance policies while samples are analyzed for chemical constituents. Excavated materials shall be placed on a base lined with 40 mil. (or higher gauge) polyethylene and be completely and securely covered with either 20-mil polyethylene sheeting or a 10-mil nylon reinforced polyethylene sheeting.

B. The nylon reinforced polyethylene membrane shall be manufactured of new, first-quality product designed and manufactured specifically for the intended use and have the following properties:

1. The material shall be 3-ply polyethylene reinforced with a nonwoven grid of high strength nylon cord.

2. The material shall be U.V. resistant and cold crack resistant to -40 degrees F.

3. The material shall be manufactured in a minimum 12-ft seamless width. Labels on the rolls shall identify the thickness, length, width, and manufacturer's mark number.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall perform all contaminated material excavation work in accordance with the Site Health and Safety Plan. Contaminated material excavation work shall include test pits, utility trenches, removal of obstructions, trench support systems, pretrenching, mass excavations, and any incidental soil work.

B. The Contractor shall excavate soil to the limits necessary to achieve the required construction as directed by the Engineer.

C. The Contractor shall provide all layout field data, including ties, to the Engineer. The Contractor shall maintain all required field controls throughout the performance of the Work.

D. All site health and safety controls shall be fully established and in operation prior to beginning any contaminated or potentially contaminated material excavation. Site controls shall include but not be limited to work zones properly barricaded, decontamination facilities, and all support equipment and supplies including personal protective equipment. All site controls shall be reviewed by the Engineer in the field.

3.2 EXCAVATION OF MATERIAL

A. Work and decontamination procedures in areas containing contaminated material shall be performed in accordance with standard engineering practices. The Contractor shall apply engineering and/or work practice controls as a means of protecting personnel in performance of site-specific tasks. Engineering controls shall be implemented to reduce and maintain employee exposure to at or below safe levels for those tasks demonstrating known or suspected hazards.

B. The Engineer shall screen the excavated material in accordance with DEP-recommended protocols. The frequency and method(s) of screening measurements will be determined by the Engineer during excavation.

C. The Engineer will evaluate the presence of contamination considering the screening results and will indicate whether the excavated material is considered contaminated, potentially contaminated, or uncontaminated. Each of these types of materials will be stockpiled separately.

D. Contractor shall employ methods necessary to isolate contaminated materials from non-contaminated soils, including benching. The Contractor shall separate excavated contaminated material based on the determination that the contaminated soil could be from more than one source and by degrees of contamination (i.e., potentially contaminated, visually contaminated) or as directed by the Engineer.

E. The Engineer will take post excavation samples from the side walls and bottom of the excavation.

F. The Engineer may direct the Contractor to excavate additional material from areas beyond the designated excavation limits containing residual product based on the analytical results from this sampling. The Contractor shall perform this Work at the unit prices established. The Contractor should expect 7 days for analytical testing.

3.3 STORAGE OF EXCAVATED MATERIAL

A. The Contractor shall temporarily stock-pile excavated material soil on-site in stockpiles not

exceeding a volume of 100 cubic yards pending material characterization and analytical results. Material shall be stockpiled in one of three stockpiles; contaminated, potentially contaminated, and uncontaminated. Determination of the deposition of excavated materials will be made by the Engineer. Material shall be stockpiled in accordance with this Section and Section 02200, Article 3.7. Contaminated soil excavation in excess of 100 cubic yards shall only be conducted with direction from the Engineer.

B. The stockpiles shall be tracked to provide complete data necessary to locate any stockpile within the site. All work necessary to coordinate stockpiling from placement to disposal shall be included. The Contractor shall provide the Engineer with duplicate copies of all documentation at the time of stockpiling.

C. The temporary stockpiled soil must be removed from the site in accordance with applicable regulatory deadlines or no later than the completion date of this contract, whichever is less. Reference is made to MADEP policy "Interim Remediation Waste Management Policy for Petroleum Contaminated Soil," WSC-94-400 and Commonwealth of Massachusetts Underground Storage Tank Closure Assessment Manual," WSC-402-96.

D. The polyethylene shall be bermed around the edges to prevent any infiltration of stormwater or exfiltration of liquid. The berm height shall be a minimum of 12-inches.

E. The polyethylene shall be adequately secured to prevent damage or loss by wind or other weather elements.

F. Stockpiles shall be securely barricaded and clearly labeled.

G. Soils shall be suitably dewatered prior to their leaving the site, to prevent free water from developing during transport to the disposal facility.

H. Hay bales shall be placed around the stockpile as per Section 02200.

3.4 SOIL TRACKING, STOCKPILE SAMPLING, AND ANALYSIS

A. The Contractor shall provide to the Engineer on a daily basis, copies of field records documenting the location of stockpiled material in the grid system, and stockpile identification data.

B. The Contractor shall track all materials from excavation to final disposition.

C. The Contractor shall take samples in such a manner as not to cause any cross-contamination. All sampling equipment shall be decontaminated between collection of samples from each stockpile.

D. The disposal facilities required analysis shall be performed by a laboratory certified for such analyses by the Commonwealth of Massachusetts as specified in 310 CMR 42.

E. The Contractor shall submit a copy of all analyses to the Engineer within 2 days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed only to Engineer and the disposal facilities. A review period of 2 days should be anticipated for Engineer's review of analytical data.

3.6 EQUIPMENT AND VEHICLE DECONTAMINATION

A. The Contractor shall design and construct a decontamination pad to be used to decontaminate equipment and vehicles exiting from contaminated areas. The Contractor shall be responsible for the maintenance and operation of the decontamination station (decontamination pad and wash down equipment) throughout the duration of the work activities. The Contractor shall provide a collection

system for the decontamination pad wash water. The Contractor shall collect all wash water resulting from the decontamination process. At the completion of the project, the Contractor shall dismantle and properly dispose of the decontamination pad and resulting contaminants.

B. The minimum design requirements of the decontamination pad are as follows:

1. Pad shall have adequate size to accommodate the width and length of the largest piece of equipment that will be used in contaminated areas.

2. The pad shall be constructed of 60-mil HDPE geomembrane material and shall have a minimum 12-inch high supported containment berm around the perimeter.

3. Pad shall be sloped to a low point sump to allow for thorough collection of decontamination water.

C. All decontamination water within the decontamination pad shall be collected, pumped to, and contained in an aboveground secure storage tank. Decontamination water shall be either treated on-site or disposed. On-site treatment and discharge shall only be allowed following the Engineer's and MADEP review (approval from Engineer required) of a treatment and testing plan. The Contractor shall have adequate storage facilities to properly contain all decontamination water. The Contractor shall submit a decontamination water collection and disposal plan as part of the Work Plan described in Section 01020.

D. The decontamination pad shall be removed and disposed of following the completion of Work. The pad shall either be disposed of with other contaminated material or disposed of as conventional rubble if the Contractor can substantiate, through analytical testing, that the debris is not contaminated. Disposal of the debris shall only be allowed following the Engineer's review of a confirmatory sampling plan. The Contractor shall submit a decontamination pad disposal plan including all proposed sampling and analysis.

END OF SECTION

D. SECTION 02160 -- TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.1 CONTRACT REFERENCES

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION

A. The Contractor shall furnish all labor, material, tools and equipment necessary for the transportation and disposal of excess contaminated materials.

B. The Contractor is encouraged to recycle/reuse contaminated soil at Out-of-State and/or In-State Recycling Facilities or In-State reuse Facilities in lieu of disposal at Out-of-State lined landfill if the excavated material is of acceptable physical quality, (proper gradation, minimal amounts of debris) and chemical quality, and the Contractor can identify a facility willing and permitted to accept the material.

C. The Contractor shall submit all of the information required in Article 3.3B of this Section for the recycling/reuse facility, if this option is selected. In addition, the Contractor shall still be responsible for submitting information on one Out-of-State lined landfill as required in Article 3.5D of this Section.

1.3 RELATED WORK

A. Section 02150 - Contaminated Material Management.

B. Section 02200 - Site Preparation: Demolition, erosion and sedimentation control measures.

C. Section 02300 - Earthwork.

1.4 SUBMITTALS

A. The Contractor shall submit to the Engineer for review, as a single submittal, all pertinent information relating to the transport and disposal of materials specified herein, within 14 days after issuance of the Notice to Proceed. The information submitted shall include, as a minimum:

1. Name and address of all hazardous material transporters to be used to complete project.

2. Massachusetts Department of Transportation Transporter Identification Number and expiration date.

3. Proof of permit, license, or authorization to transport hazardous material in all affected states.

4. Soil recycling/asphalt batch information described in Article 3.3.

5. Landfill information described in Article 3.5.

1.5 DEFINITIONS

A. TSCA/RCRA Landfill - This type of landfill shall accept soil that contains PCB at levels of 50 ppm to 500 ppm, acceptable for landfill disposal as defined in 40 CFR Part 761; soil that is classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261 but meets the treatment standards established in 40 CFR Part 268 - Land Disposal Restrictions; and all other soil classified as a hazardous material in 310 CMR 30.00. This type of landfill shall be approved to operate under a Federal Part B operating permit and shall be permitted to accept material with PCB concentrations up to 500 ppm under TSCA. The landfill shall be designed with a double composite liner meeting minimum RCRA design requirements. The landfill will operate a leachate collection system and will also operate a leak detection well system. The landfill shall be capable of stabilizing soils for meeting requirements of the USEPA's present rules required under the 1984 amendments to RCRA, banning the land disposal of hazardous material.

B. RCRA Landfill - This type of landfill shall accept soil that contains PCBs levels below 50 ppm; soil that is classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261 but meets the treatment standards established in 40 CFR Part 268 - Land Disposal Restrictions and all other soil classified as a hazardous material in 310 CMR 30.00. This type of landfill shall be approved to operate under a Federal Part B operating permit. The landfill shall be designed with a double composite liner meeting minimum RCRA design requirements. The landfill will operate a leachate collection system and will also operate a leak detection well system. The landfill shall be capable of stabilizing soils for meeting requirements of the land ban.

C. Non-RCRA Out-of-State Lined Landfill - This type of landfill shall be state approved or permitted to

accept soil that is defined as a hazardous material in 310 CMR 30.00, but is not classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261; soil containing PCBs below 50 ppm; and all other soil not permitted or unsuitable for in-state disposal or recycling.

D. Out-of-State Recycling Facility - This type of facility shall be state approved or permitted to accept soil that is defined as a hazardous material in 310 CMR 30.00, but is not classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261; soil containing PCBs below the facility's permitted level; and all other soil not permitted or unsuitable for in-state disposal or recycling.

E. In-State Recycling Facility - This type of facility shall be approved by the Commonwealth of Massachusetts to accept soil that is classified as petroleum contaminated soil, that would be classified as a hazardous material in 310 CMR 30.00 if not managed under M.G.L. c.21 E and 310 CMR 40.00; and is not classified as a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261.

F. In-State Landfill Facility (Reuse as Cover Material) - This type of facility shall be approved by the Commonwealth of Massachusetts to accept soil that is classified as petroleum contaminated soil, that would be classified as a hazardous material in 310 CMR 30.00 if not managed under M.G.L. c.21 E and 310 CMR 40.00; and is not classified as a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261.

G. Material - Soil, pavement, cobblestones, sorptive pads, ballast, railroad ties, rocks, concrete, pipes, and miscellaneous structures and debris.

1.6 REGULATORY REQUIREMENTS

A. The Work of this Section shall be performed in accordance with all applicable Federal, State, and local regulations, laws, codes, and ordinances governing the handling, transportation, and disposal of hazardous material.

B. The Contractor shall obtain all Federal, State and local permits required for the transport and disposal of contaminated material. The Contractor shall adhere to all permit requirements.

C. The Contractor shall document that the disposal facilities proposed have all certifications and permits as required by Federal, State and local regulatory agencies to receive and dispose of the contaminated soil.

D. The Contractor shall not dispose of contaminated material at a landfill if a feasible alternative exists that involves the reuse, recycling, destruction, and/or detoxification of the material in accordance with 310 CMR 40.0032 (5).

PART 2 PRODUCTS

2.1 GENERAL

A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work as indicated in the Site Health and Safety Plan.

PART 3 EXECUTION

3.1 GENERAL

A. The University of Massachusetts - Lowell will be the generator and will sign all manifests and MADEP bills of lading. Except for soils transported under a hazardous material manifest, all soil

material shall be transported under MADEP bills of lading regardless of the chemical quality of the soils. The Contractor shall prepare a summary of analytical data as part of Bill of Lading package. Bill of Lading will be prepared by the Contractor and may be subject to MADEP review and approval. The Engineer will provide LSP Services and approve all Bill of Ladings prior to transport.

B. Utilization of a hazardous material manifest shall require the use of a licensed hazardous material transporter in conformance with the Massachusetts Hazardous Material Regulations as required by 310 CMR 30.000. MCP provisions state that Licensed Site Professional Opinion is not required when using a hazardous material manifest when transporting contaminated materials.

3.2 MATERIAL CHARACTERIZATION

A. The Contractor shall be responsible for characterizing the material for the purpose of obtaining approvals for final disposal of contaminated material. The Contractor shall collect material samples to perform testing required by the disposal facility.

1. The Contractor shall be required to submit a copy of all analytical results to the Engineer within 2 days of receipt of the laboratory report. Analytical data shall be kept confidential, and distributed to the Engineer and Owner only. Engineer's review of data will be 2 days.

B. Sampling of contaminated material shall be done at sufficient and adequately distributed locations so that the concentrations of the chemical constituents of concern which may be present are adequately characterized.

C. Contractor will coordinate schedule so that Engineer may observe sample collection.

3.3 MATERIAL RECYCLING

A. The material recycling facility shall be permitted pursuant to 310 CMR 30.00 and 310 CMR 19.00 and shall be a hot mix asphalt plant, thermal processing plant or a cold mix emulsion plant. The facility shall be eligible to accept petroleum contaminated soil material without MADEP approval provided that levels of contaminants in the material are below de minimus levels listed below, and specific levels established in the facility's Class A Recycling Permit.

B. The Contractor shall submit to the Engineer initial approvals or letters of intent and facility information for the recycling facility selected, within 14 Days of issuance of the Notice to Proceed. The facility information shall include the following:

1. General Information

a. Facility Name

b. Facility Address

c. Name of Contact Person

d. Title of Contact Person

e. Telephone Number of Contact Person.

f. Permit Number.

2. The facility shall specify the volume of material that can be accepted from the site on a weekly and a total basis.

3. The facility shall provide written confirmation that they are permitted to accept and will accept the classified soil of the general quality and quantity described by these Specifications.

4. The facility shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this Contract.

5. The Contractor shall submit a complete list of the disposal facility's permitted allowable contaminant levels and physical characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams.

6. Material set for asphalt batching shall not exceed any of the maximum contaminant levels presented below.

NOTE: Regulatory thresholds are subject to change and should be reviewed carefully prior to placing project to bid. These are current as of August 1998.

FACILITY MAXIMUM CONTAMINANT LEVELS			
Contaminant	**Hot Mix Asphalt Plant (mg/kg)**	**Thermal Processing Plant (mg/kg)**	**Cold Mix Emulsion Plant (mg/kg)**
Total Arsenic (As)	30	30	30
Total Cadmium (Cd)	30	11	30
Total Chromium	500	500	500
Total Mercury	10	3	10
Total Lead	1,000	1,000	1,000
Total VOCs	30 to 1,800	30 to 1,800	30 to 1,800
TPH	5,000 to 60,000	5,000 to 6,000	5,000 to 60,000
Total PCBs	<2	<2	<2
Total Halogenated VOCs	5	5	5
Listed or Characteristic Hazardous Waste (TCLP)	None	None	None

3.4 MATERIAL REUSE AT LINED AND UNLINED LANDFILLS

A. Contaminated materials that exhibit concentrations equal to or below de minimus levels listed below and satisfy the physical requirements for landfill reuse and do not need specific DEP approval, may be transported to a lined or unlined landfill using the bill of lading procedures.

Contaminant	Reuse Levels (mg/kg)	
	Lined Landfill	Unlined Landfill
Total Arsenic	40	40
Total Cadmium	80	30
Total Chromium	1,000	1,000
Total Lead	2,000	1,000
Total Mercury	10	10
Total Petroleum Hydrocarbons (TPH)	5,000	2,500
Total PCBs	<2	<2
Total SVOCs	100	100

Total VOCs	10	4
Conductivity (umhos/cm)	8,000	4,000
Listed or Characteristic Hazardous Waste (TCLP)	None	None

B. Material reuse shall consist of daily cover, intermediate cover, and pre-cap contouring material.

C. Materials which exceed the chemical criteria listed above or contain concentrations of oil and/or hazardous materials for which no threshold is specified, may be reused at a lined landfill upon approval by MADEP Division of Solid Waste Management. The Contractor shall be responsible for obtaining this approval at no cost to the Owner. Approval in writing shall be obtained from DEP and provided to Engineer for review prior to transport of material.

3.5 LANDFILL

A. The Contractor shall identify two landfills that are permitted to and will accept the type of material specified in this Contract for disposal.

B. The Contractor shall select landfills that are established, fully operational, and in full compliance with all applicable Federal, State, and local regulations.

C. The Contractor shall designate one landfill as the primary facility and the other as the alternate facility should project conditions require the use of a back-up facility. The OWNER will not incur any additional costs if an alternate facility is utilized.

D. The Contractor shall submit to the Engineer initial approvals or letters of intent and facility information for the landfills selected, within 14 Days of issuance of the Notice to Proceed. The facility information shall include the following:

1. General Information

    a. Facility Name

    b. Facility Address

    c. Name of Contact Person

    d. Title of Contact Person

    e. Telephone Number of Contact Person.

    f. Permit Number.

2. The landfills shall specify the volume of material that can be accepted from the site on a weekly and a total basis.

3. The landfills shall provide written confirmation that they are permitted to accept and will accept the classified soil of the general quality and quantity described by these Specifications.

4. The landfills shall provide a listing of all current and valid permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils or materials specified in this Contract.

5. The Contractor shall submit a complete list of the disposal/landfill facility's permitted allowable contaminant levels and physical characteristic requirements for contaminated material, and list any required regulatory approvals for individual waste streams.

3.6 WASTE PROFILES AND MANIFESTS

A. The Contractor shall be responsible for preparing and submitting to the Engineer for review all waste profile applications and questionnaires, and coordination with disposal facilities and all Federal and State Environmental Agencies.

B. The Contractor shall be responsible for preparing all hazardous material manifests and 21E bills of lading with all applicable analytical backup, notification, and control forms. Contractor shall submit these to the Engineer for review at least 5 days before transport. The Engineer will provide LSP signature for bill of ladings.

C. The Contractor shall also provide certified tare and gross weight slips for each load received at the designated facility which shall be attached to each returned manifest and bill of lading.

D. The Owner will be designated as generator and will sign all manifests and waste profile application or questionnaires.

E. The Contractor shall furnish all generator copies of the hazardous material manifest to the Engineer for submittal to the appropriate State Environmental Agencies and to retain for the Owner's records.

F. The Contractor shall submit to the Engineer, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility. The documentation shall include the following, as a minimum.

1. Documentation shall be provided for each load from the site to the disposal facility, including all manifests and any other transfer documentation as applicable.

2. All documentation for each load shall be tracked by the original manifest document number that was assigned by the Engineer at the site.

3.7 TRANSPORT OF CONTAMINATED MATERIAL

A. The Contractor shall not be permitted to transport contaminated materials off-site until all disposal or recycling facility documentation has been received, reviewed, and accepted by the Engineer.

B. The Contractor shall transport contaminated materials from the site to the disposal or recycling facility in accordance with all United States Department of Transportation (DOT), USEPA, MADEP regulations and other regulations of all affected states.

C. The Hauler(s) shall be licensed in all states affected by transport.

D. The Contractor shall provide to the Engineer copies of all weight slips, both tare and gross, for every load weighed and disposed of at the accepted disposal facility. The slips shall be tracked by the original manifest document number that was assigned by the Engineer at the site. The Owner shall only make progress payments upon receipt of these weight slips.

E. The Contractor shall be responsible for ensuring that free-liquid does not develop during transport. "Wet soils" shall not be loaded for transport. The Contractor shall be responsible to properly dispose of any free liquids that may result during transportation.

F. The temporary stockpiled material must be removed from the site in accordance with applicable regulatory deadlines however no later than the completion date of this contract as may be extended.

END OF SECTION

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Appendix P
Sample List of Asbestos Containing Material

The following is a partial list of asbestos containing material. It is intended that this list be used to identify the possibility that asbestos may exist. If any of these items are present, a hygenist should be hired to test all of the suspect areas.

Cement pipes	Elevator brake shoes
Cement wallboard	HVAC duct insulation
Cement siding	Boiler Insulation
Asphalt floor tile	Breeching Insulation
Vinyl floor tile	Ductwork flexible fabric connections
Vinyl sheet flooring	Cooling towers
Floor backing	Pipe insulation
Construction mastics	Heating and electrical ducts
Acoustical plaster	Electrical panel partitions
Decorative plaster	Electrical cloth
Textured paints/coatings	Electric wiring insulation
Ceiling tiles and lay-in panels	Chalkboards
Spray applied insulation	Roofing shingles
Blown-in insulation	Roofing felt
Fireproofing materials	Base flashing
Taping compounds (thermal)	Thermal paper products
Packing materials	Fire doors
High temperature gaskets	Caulking/putties
Laboratory hoods/table tops	Adhesives
Laboratory gloves	wallboard
Fire blankets	Joint compound
Fire curtains	Vinyl wall covering
Elevator equipment panels	spackling compounds

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Appendix Q
Construction Progress Schedules

[Designer's Note: The following specification sections are grouped by project dollar value. Choose the schedule requirements that best suit your project and include it as your Construction Progress Schedule requirement in the specifications.]

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SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Conventional Project Methodology w/ FLCC $ 1 to $ 1 MM)

1.01 General Provisions

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 Construction Schedule

A. Contractor shall prepare and submit, for Architect and Asset Management's information, a Progress Schedule for the work of the project. Said schedule will be coordinated to include sequencing of the
B. project work (if sequencing is required).
   1. General Schedule Requirements
   2. Specific Schedule Requirements
   3. Schedule Submission Requirements
   4. Project Schedule Reporting and Changes
   5. Progress Payments to Contractor
   6. Adjustment of Contract Completion Time

1.03 Related Sections

A. CONTRACT AND GENERAL CONDITIONS
   1. Failure to Complete the Work on Time --- Liquidated Damages.

B. SECTION 01200 --- PROJECT MEETINGS
   1. Project Meetings

C. SECTION 01340 --- SUBMITTALS
   1. Progress Reports
   2. Schedule of Values
   3. Shop Drawings, Product Data and Samples

1.04 Progress Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided by the Contractor.
   1. General Schedule Requirements
      a. Upon the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall develop a Bar Chart Diagram as defined hereinafter, demonstrating complete fulfillment of all contract requirements. The Contractor shall keep the bar chart up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the bar chart in planning, coordinating and performing the work of this project (including all construction-related activities of designer, subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities.
      b. Within 15 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management and the Designer, a Bar Chart Diagram for the complete project. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
      c. Within 15 calendar days after receipt of the Bar Chart Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant engineers and subcontractors, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed Bar Chart Diagram in accordance

with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.04.A.3), to Asset Management and one copy to the Designer. This Bar Chart Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.A.4). All appropriate trade contractors and suppliers shall also be furnished copies of the Bar Chart Diagram.

2. Specific Scheduling Requirements
   a. The Project Schedule shall show the sequence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the schedule shall be equal to the number of items listed in the Schedule of Values. To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything not jointly agreed upon, itshall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the schedule.
   b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, and cost.
      1) Each activity shall be assigned a Work Breakdown Structure Code (WBS). The WBS is a structured in levels of deliverable work elements beginning with the end result (Level 1) and the divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manger, Designer and Contractor will meet to establish a WBS specific to the project.
      2) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division and specification section.

3. Schedule Submission Requirements (Bar Chart Diagram Elements and Lists)
   a. As a minimum, the Contractor shall furnish, monthly with each schedule submission, and each revision thereof required in the logic update, the following:
      1) Gantt Chart sorted per Asset Management Project Manager direction
      2) Target Schedule Comparison Gantt Chart sorted per Asset Management Project Manager direction
      3) Two-Week Look Ahead Gantt Chart sorted per Asset Management Project Manager direction (and in narrative format if requested by the Asset Management Project Manager, at no additional cost)
   b. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to be produced monthly, which is coordinated with 1) and 2) above.
   c. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. All items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items shall be so identified on the Material/Supplies Schedule. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Materials/Supplies Schedule shall be updated as directed by the Asset Management and as a minimum at each Logic Update period.
   d. Utilities Listing: As a minimum, a full list of all utilities required for the project shall be listed.

4. Project Schedule Reporting and Changes (Progress and Logic Update)
   a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity.
   b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Schedule Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the Schedule Submission. The contract completion date or dates shall be adjusted to

reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination as to the amount of time extension to be granted, and the parties are unable to agree as to the amount of the extension to be reflected in the schedule, the Contractor shall reflect that amount of time extension in the schedule as Asset Management may determine, in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final determination as to any time extension, the Contractor will revise the schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Contractor, including input from subcontractors, trade contractors and the Architect, shall update the schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the schedule approved in accordance with the Specific Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.A.2 and 1.04.A.4).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the schedule occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly updates how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase construction manpower in such quantities and crafts as will substantially eliminate, in the judgment of Asset Management, the backlog of work.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of Asset Management, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period, the delay will be entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. Asset Management shall have the right to require the Contractor to furnish additional printouts of updated schedules, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor
   a. The monthly Schedule Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated schedule. Payments will be made against activity items shown on the schedule and as reflected on Asset Management approved format payment forms. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.
   b. In the event the Contractor fails to submit a schedule or the initial or revised schedule update on the date designated by the Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the schedule prepared or revised (as applicable) by separate scheduling contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish the information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the calendar-dated schedule by separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:
      1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 50 per day for every day the schedule submittal is late.
      2) Terminate the contract with prejudice (per Article VIII of the contract).

6. Adjustment of the Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as the Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected. Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. Contract time can only be extended by authorized approved change order.
   b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.
   c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.
      1) The Asset Management Certificate of Use and Occupancy may be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
      2) The Contractor shall have the number of calendar days stated in the contract, from the date of Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the

Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

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SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Conventional Project Methodology w/ FLCC $ 1 MM to $5 MM)

1.01 General Provisions

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 Construction Schedule

A. Contractor shall prepare and submit, for Architect and Asset Management's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated to include sequencing of the project work (if sequencing is required). In addition, a Project Scheduler will be required for this project.
   1. General Schedule Requirements
   2. Critical Path Method (CPM) Schedule Requirements
   3. Critical Path Submission Requirements
   4. Critical Path Progress Reporting and Changes
   5. Progress Payments to Contractor
   6. Adjustment of Critical Path Contract Completion Time

B Critical Path Method Scheduler

1.03 Related Sections

A. CONTRACT AND GENERAL CONDITIONS
   1. Failure to Complete the Work on Time --- Liquidated Damages.

B. SECTION 01200 --- PROJECT MEETINGS
   1. Project Meetings

C. SECTION 01340 --- SUBMITTALS
   1. Progress Reports
   2. Schedule of Values
   3. Shop Drawings, Product Data and Samples

1.04 Critical Path Method Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided by the Contractor.
   1. General Schedule Requirements
      a. Upon the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall develop a network plan as defined hereinafter, demonstrating complete fulfillment of all contract requirements. The Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all construction-related activities of designer subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. The Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined hereinafter under Additional Requirements - Computer Equipment and Software. Substitute software, approved in writing by Asset Management, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all Asset Management supplied software.

b. Within 15 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management, a Time Scaled Critical Path Method (CPM) Network Diagram for the first 60 days of the project. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.

c. Within 45 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the complete project. All completion dates shall be within the period specified for contract completion. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.

d. Within 15 calendar days after receipt of the Critical Path Method Network Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant engineers and subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.04.A.3), to the Asset Management and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.A.4). All appropriate trade contractors and shall also be furnished copies of the Time Scaled Network Diagram.

e. Until the joint review(s) and subsequent issuance of the Project Schedule, as defined here in before, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements

a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule shall be equal to the number of items listed in the Schedule of Values, however the Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction (i.e., procurement of materials and delivery of equipment) and any other activities for which Asset Management may approve the showing of longer duration. The schedule shall show not only the activities for actual construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times Designer/ Asset Management review and approval of shop drawings, equipment schedules samples and templates, and the delivery of Owner furnished equipment). All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.04.A.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, predecessor activity and successor activity.

1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.

2) Each activity shall be assigned a Work Breakdown Structure Code (WBS). The WBS is a structured in levels of deliverable work elements beginning with the end result (Level 1) and the

divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manger, Designer and Contractor will meet to establish a WBS specific to the project.

3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section and corresponding Schedule of Values ID. This is not a complete list, the Asset Management Project Manager, Designer and Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA Graphic Reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager
      2) Target Schedule Comparison Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager
      3) Organized by Weekly or Monthly Gantt Chart sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Organized by Predecessor Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager
      5) Two-Week Look Ahead Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager (and in narrative format if requested by the Asset Management Project Manager, at no additional cost)
   b. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to produced monthly, which uses the PRIMAVERA database percentage complete to calculated payment owed to the Contractor.
   c. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by Asset Management.
   d. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.04.A.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which all materials required for critical activities, all items of long lead time nature (i.e., transformers plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by Asset Management and as a minimum at each Logic Update period.
   e. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)
   a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with payment requisition forms required here in before (in sub-paragraph 1.04.A.3.b.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.
   b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last

revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the Contractor shall reflect that amount of time extension in the critical path schedule as Asset Management may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final determination as to any time extension, the Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Project Scheduler, including input from Contractor, subcontractors, trade contractors and the Architect, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.A.2 and 1.04.A.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and Asset Management approval of all entries, the Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.04.A.3), to Asset Management, no later than the close of business on the date specified by Asset Management for submission of edited Contractor monthly payment requisition (normally one week after pencil monthly requisition review).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase construction manpower in such quantities and crafts as will substantially eliminate, in the judgment of the Asset Management, the backlog of work.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the Asset Management, the backlog of work.

3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. Asset Management shall have the right to require the Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor

a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on Asset Management approved format payment forms which shall be used in conjunction with PRIMAVERA. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.

b. Whereas every schedule activity is cost loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the Contractor's payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish then information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:

1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 100 per day for every day the schedule submittal is late.

2) Terminate the contract with prejudice (per Article VIII of the contract).

6. Adjustment of Critical Path Contract Completion Time

a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with

the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items. Contract time can only be extended by authorized approved change order.

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.

   1) The Asset Management Certificate of Use and Occupancy may be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
   2) The Contractor shall have the number of calendar days stated in the contract, from the date of Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements:

   A. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every submittal shop drawings, product data, samples and other submittal required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   B. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   C. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   D. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every Owner-furnished item required by the contract, General Conditions, Supplementary

Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.

a) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.
b) Neither the Architect nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

E. A list in EXCEL format and the associated database file, as described by Asset Management, of projected and actual spending (a.k.a., Spending Plan), to be produced initially and updated monthly.

1.05 Critical Path Method Scheduler

A. The Contractor shall provide a part-time, independent, or in-house project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Architect and Asset Management Project Manager for mutual approval. The Project Scheduler shall have a minimum of three [3] years of project CPM scheduling experience, one [1] year of which shall be of projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the Asset Management Project Manager deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Asset Management inspection staff, job photos, weekly meeting minutes, monthly progress reports, Contractor weekly bar charts or three-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of the Asset Management and the Contractor.
2. Sequestering of float shall be cause for rejection of the Contractor's schedule submittal. In the event that float sequestering is identified the Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The Contractor, through the Project Scheduler, shall require all major subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The Contractor must submit an as-built construction schedule (certified by the Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Conventional Project Methodology w/ FLCC $5 MM to $10 MM)

1.01 General Provisions

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 Construction Schedule

A. Contractor shall prepare and submit, for Architect and Asset Management's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated to include sequencing of the project work (if sequencing is required). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to Contractor
6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler

1.03 Related Sections

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to Complete the Work on Time --- Liquidated Damages.

B. SECTION 01200 --- PROJECT MEETINGS

1. Project Meetings

C. SECTION 01340 --- SUBMITTALS

1. Progress Reports
2. Schedule of Values
3. Shop Drawings, Product Data and Samples

1.04 Critical Path Method Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided by the Contractor.

1. General Schedule Requirements
    a. Upon the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall develop a network plan as defined hereinafter, demonstrating complete fulfillment of all contract requirements. The Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all construction-related activities of designer subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. The Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined hereinafter under Additional Requirements - Computer Equipment and Software. Substitute software, approved in writing by Asset Management, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all Asset Management supplied software.
    b. Within 30 calendar days of the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit to Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the project. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
    c. Within 60 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the complete project. All completion dates shall be within the period specified for contract completion. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
    d. Within 15 calendar days after receipt of the Critical Path Method Network Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant and subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as hereinafter (in Para. 1.04.A.3), to Asset Management and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.A.4). All appropriate trade contractors and suppliers shall also be furnished copies of the Time Network Diagram.
    e. Until the joint review(s) and subsequent issuance of the Project Schedule, as defined here in before, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements
    a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule shall be equal to the number of items listed in the Schedule of Values, however the Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., procurement of materials and delivery of equipment) and any other activities for which Asset Management may approve the showing of longer duration. The schedule shall show not only the activities for actual construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/ Asset Management review and approval of shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). All activities shall be logically

tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.04.A.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, predecessor activity and successor activity.
   1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
   2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1) and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manager, Designer and Contractor will meet to establish a WBS specific to the project.
   3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section and corresponding Schedule of Values ID. This is not a complete list, the Asset Management Project Manager, Designer and Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA Tabular Schedule Output Reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Schedule Sort by Early Start and Total Float
      5) Actual Cash Flow (on schedule - Monthly; late schedule - Weekly)
   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per Asset Management Project Manager (and in narrative format if requested by the Asset Management Project Manager, at no additional cost).
      3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per Asset Management Project Manager
   c. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to be produced monthly which uses the PRIMAVERA database percentage complete to calculated payment owed to the Contractor.
   d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by Asset Management.
   e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.04.A.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub lists

shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by Asset Management and as a minimum at each Logic Update period.

f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. The Contractor shall manually update the latest computer generated Gantt Chart and Time Scaled Network Diagram for review at each project job meeting.

h. A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.04.A.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the Contractor shall reflect that amount of time extension in the critical path schedule as Asset Management may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final determination as to any time extension, the Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Project Scheduler, including input from Contractor, subcontractors, trade contractors and the Architect, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.A.2 and 1.04.A.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity

which has either started during the monthly update period or is ongoing. In addition entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and Asset Management approval of all entries, the Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.04.A.3), to Asset Management, no later than the close of business on the date specified by Asset Management for submission of edited Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase construction manpower in such quantities and crafts as will substantially eliminate, in the judgment of Asset Management, the backlog of work.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgmentof Asset Management, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. Asset Management shall have the right to require the Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor
   a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved

updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on Asset Management approved format payment forms which shall be used in conjunction with PRIMAVERA. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.

b. Whereas every schedule activity is cost loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the Contractor's payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish the information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:
   1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 150 per day for every day the schedule submittal is late.
   2) Terminate the contract with prejudice (per Article VIII of the contract).

6. Adjustment of Critical Path Contract Completion Time

a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items. Contract time can only be extended by authorized approved change order.

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually

or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.

1) The Asset Management Certificate of Use and Occupancy may be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
2) The Contractor shall have the number of calendar days stated in the contract, from the date of Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements:

A. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every submittal shop drawings, product data, samples and other submittal required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

B. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

C.) A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

D. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.
    a) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.
    b) Niether the Architect nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

E. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of projected and actual spending (a.k.a., spending Plan), to be produced initially and updated monthly, indicating all projected and actual expenditures.

1.05 Critical Path Method Scheduler

A. The Contractor shall provide a part-time, independent, project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Architect and Asset Management Project Manager for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be of projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the Asset Management Project Manager deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Asset Management inspection staff, job photos, weekly meeting minutes, monthly progress reports, Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of Asset Management and the Contractor.

2. Sequestering of float shall be cause for rejection of the Contractor's schedule submittal. In the event that float sequestering is identified the Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The Contractor, through the Project Scheduler, shall require all major subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The Contractor must submit an as-built construction schedule (certified by the Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

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SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Conventional Project Methodology w/ FLCC $ 10 MM - 20 MM)

1.01 General Provisions

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 Construction Schedule

A. Contractor shall prepare and submit, for Architect and Asset Management's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated to include sequencing of the project work (if sequencing is required). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements
2. Critical Path Method (CPM) Schedule Requirements
3. Critical Path Submission Requirements
4. Critical Path Progress Reporting and Changes
5. Progress Payments to Contractor
6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler

1.03 Related Sections

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to Complete the Work on Time --- Liquidated Damages.

B. SECTION 01200 --- PROJECT MEETINGS

1. Project Meetings

C. SECTION 01340 --- SUBMITTALS

1. Progress Reports
2. Schedule of Values
3. Shop Drawings, Product Data and Samples

1.04 Critical Path Method Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided by the Contractor.

1. General Schedule Requirements
   a. Upon the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall develop a network plan as defined hereinafter, demonstrating complete fulfillment of all contract requirements. The Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all construction-related activities of designer subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. The Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined hereinafter under Additional Requirements - Computer Equipment and Software. Substitute software, approved in writing by Asset Management, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all Asset Management supplied software.
   b. Within 30 calendar days of the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit to Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the project. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
   c. Within 60 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the complete project. All completion dates shall be within the period specified for contract completion. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
   d. Within 15 calendar days after receipt of the Critical Path Method Network Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant engineers and subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.04.3), to Asset Management and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.4). All appropriate trade contractors shall also be furnished copies of the Time Scaled Network Diagram.
   e. Until the joint review(s) and subsequent issuance of the Project Schedule, as defined hereinbefore, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements
   a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the Contractor must submit a detailed explanation that identifies what each activity includes In preparing the Critical Path schedule, the Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., procurement of materials and delivery of equipment) and any other activities for which Asset Management may approve the showing of longer duration. The schedule shall show not only the activities for actual construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/ Asset Management review and approval of shop drawings, equipment schedules, samples and

templates, and the delivery of Owner furnished equipment). All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.04.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, predecessor activity and successor activity.
   1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
   2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manager, Designer and Contractor will meet to establish a WBS specific to the project.
   3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section and corresponding Schedule of Values ID. This is not a complete list. The Asset Management Project Manager, Designer and Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Schedule Sort by Early Start and Total Float
      5) Actual Cash Flow (on schedule - Monthly; late schedule - Weekly)
   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by early start date and WBS or Activity Codes, per Asset Management Project Manager
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per Asset Management Project Manager (and narrative format if requested by the Asset Management Project Manager, at no additional cost)
      3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per Asset Management Project Manager
   c. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to Contractor.
   d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by Asset Management.
   e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.04.7) relating to the activity

codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by the Asset Management and as a minimum at each Logic Update period.

f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. The Contractor shall manually update the latest computer generated Gantt Chart and Time Scaled Network Diagram for review at each project job meeting.

h. A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

   a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.04.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

   b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the Contractor shall reflect that amount of time extension in the critical path schedule as Asset Management may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final determination as to any time extension, the Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

   c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Project Scheduler, including input from Contractor, subcontractors, trade contractors and the Architect, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.2 and 1.04.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which

has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and Asset Management approval of all entries, the Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para.1.04.3), to Asset Management, no later than the close of business on the date specified by Asset Management for submission of edited Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase construction manpower in such quantities and crafts as will substantially eliminate, in the judgment of the Asset Management, the backlog of work.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing sufficiently to substantially eliminate, in the judgment of Asset Management, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. The Asset Management shall have the right to require the Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor
   a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved

updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on Asset Management approved format payment forms which shall be used in conjunction with PRIMAVERA. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.

b. Whereas every schedule activity is cost loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the Contractor's payment application is a listing schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish the information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:
   1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 250 per day for every day the schedule submittal is late.
   2) Terminate the contract with prejudice (per Article VIII of the contract).

6. Adjustment of Critical Path Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items. Contract time can only be extended by authorized approved change order.
   b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.
   c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually

or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.

1) Asset Management Certificate of Use and Occupancy may be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
2) The Contractor shall have the number of calendar days stated in the contract, from the date of Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements:
   A. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every submittal shop drawings, product data, samples and other submittal required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   B. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   C. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   D. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.
      a) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.
      b) Neither the Architect nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

E. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of projected and actual spending (a.k.a., Spending Plan), to be produced initially and updated monthly, indicating all projected and actual expenditures.

1.05 Critical Path Method Scheduler

A. The Contractor shall provide a part-time, independent, project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Architect and Asset Management Project Manager for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be of projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the Asset Management Project Manager deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Asset Management inspection staff, job photos, weekly meeting minutes, monthly progress reports, Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of Asset Management and the Contractor.

2. Sequestering of float shall be cause for rejection of the Contractor's schedule submittal. In the event that float sequestering is identified the Contractor, through the Project Scheduler, shall have the computer produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The Contractor, through the Project Scheduler, shall require all major subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The Contractor must submit an as-built construction schedule (certified by the Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

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SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Design/Build or Modular Project Methodology)

1.01 Contractual Relationships

A. For Design/Build and Modular Project Methodologies, the contractual relationships and functions are as follows:

1. For Design/Build and Modular Projects
   a. Contractor has separate contracts with
      1) Division of Capital Asset Management (a.k.a. Asset Management)
      2) Architect-of-Record

1.02 Construction Schedule

A. Contractor shall prepare and submit for Architect and Asset Management's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated with the Designer's Work Plan to include sequencing of the project work (both design and construction). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements

2. Critical Path Method (CPM) Schedule Requirements

3. Critical Path Submission Requirements

4. Critical Path Progress Reporting and Changes

5. Progress Payments to Contractor

6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler

C. Design of Project

1.03 Related Sections

A. SECTION 01200 --- PROJECT MEETINGS
   1. Project Meetings

B. SECTION 01340 --- SUBMITTALS

1. Progress Reports

2. Schedule of Values

3. Shop Drawings, Product Data and Samples

1.04 Critical Path Method Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided to Asset Management by the Contractor.

1. General Schedule Requirements
   a. Upon the finalization of the agreement, signified by issuance of the first Asset Management Notice to Proceed (with Design Development documents), the Contractor shall develop a network plan as defined hereinafter, demonstrating complete fulfillment of all Design Development documents contract requirements.
   b. Upon receipt of the second Asset Management Notice to Proceed (with Working Documents and Construction), the Contractor shall expand his/her network plan to demonstrate complete fulfillment of all Working Documents and Construction contract requirements. The Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all activities of designer, subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. Upon authorized commencement of the second phase of the contract, as signified by the second Asset Management Notice to Proceed (with Working Documents and Construction), the Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined hereinafter under Additional Requirements - Computer Equipment and Software. Substitute software, approved in writing by Asset Management, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all Asset Management supplied software.
   c. Within 10 calendar days of receipt of the first Asset Management Notice to Proceed (with Design Development documents), the Contractor shall submit to Asset Management and the Designer a Time Scaled Critical Path Method (CPM) Network Diagram for the first phase - Design Development documents of the project.
   d. Within 20 calendar days of receipt of the second Asset Management Notice to Proceed (with Working Documents and Construction), the Contractor shall submit to Asset Management and the Designer, an expanded Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the Working Document/Construction phase of the project. This preliminary 90-day schedule need not be resource loaded.
   e. Within 60 calendar days after receipt of the second Asset Management Notice to Proceed (with Working Documents and Construction), the Contractor shall submit for review by Asset Management and the Designer, a complete Time Scaled Critical Path Method (CPM) Network Diagram for the complete project, including all design and construction phases. All completion dates shall be within the period required by the contract for completion of the project. This complete duration project schedule must be fully resource loaded. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.
   f. Within 15 calendar days after receipt of the complete Critical Path Method Network Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant engineers and subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.04.3), to the Asset Management and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.4). All appropriate trade contractors shall also be furnished copies of the Time Scaled Network Diagram.
   g. Until the joint review(s) and subsequent issuance of the complete Project Schedule, as defined here in before, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements
   a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., design, procurement of materials and delivery of equipment) and any other activities for which Asset Management may approve the showing of longer duration. The schedule shall show not only the activities for actual design and construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times, Designer/Asset Management review and approval of design documents and shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). In addition, the complete duration project schedule submission that is to be made 60 calendar days after receipt of the second Asset Management Notice to Proceed (with Working Documents and Construction) shall be resource loaded with costs, manpower (labor by craft or trade), and equipment for all on-site construction activities shown on the schedule. All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.04.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the Critical Path schedule.
   b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, resources, custom data items, predecessor activity and successor activity.
      1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
      2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manager, Designer and Contractor will meet to establish a WBS specific to the project.
      3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section and corresponding Schedule of Values ID. This is not a complete list. The Asset Management Project Manager, Designer and Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Schedule sort by Early Start and Total Float

5) Actual Cash, Manpower and Equipment Flows (on schedule - Monthly; late schedule - Weekly)

b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
   1) Gantt Chart sorted by Early Start date and WBS or Activity Codes, per Asset Management Project Manager
   2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per Asset Management Project Manager (and narrative format if requested by the Asset Management Project Manager, at no additional cost)
   3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per Asset Management Project Manager
   4) Cash, Manpower and Equipment Flows (monthly and cumulative)

c. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to Contractor.

d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by Asset Management.

e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.04.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by the Asset Management and as a minimum at each Logic Update period.

f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.

g. Equipment Schedule: As a minimum, a full list of all equipment required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of equipment, usage levels required, and timing of requirements.

h. The Contractor shall manually update the latest computer generated Gantt Chart and Time Scaled Network Diagram for review at each project job meeting.

i. A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)

   a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.04.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.

   b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for

adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the Contractor shall reflect that amount of time extension in the critical path schedule as Asset Management may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final determination as to any time extension, the Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Project Scheduler, including input from Contractor, subcontractors, trade contractors and the Architect, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.2 and 1.04.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and Asset Management approval of all entries, the Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.04.3), to Asset Management, no later than the close of business on the date specified by Asset Management for submission of edited Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the first Asset Management Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Building Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:

1) Increase design and/or construction manpower and/or equipment in such quantities and crafts as will substantially eliminate, in the judgment of the Asset Management, the backlog of work and any impact on the construction activities.
2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of the Asset Management, the backlog of work.
3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi-weekly) and at the same time as the updated schedule required by the preceding paragraphs in a form agreed upon by the Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. The Asset Management shall have the right to require the Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor

a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on Asset Management approved format payment forms which shall be used in conjunction with PRIMAVERA. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.

b. Whereas every schedule activity is cost loaded, as well as manpower and equipment loaded (i.e., the schedule of payment values lists all schedule activities, at the end of every month the Contractor's payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish the information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:
1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 300 per day for every day the schedule submittal is late.

2) Terminate the contract with prejudice (per Article IX of the contract).

6. Adjustment of Critical Path Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using resource loaded fragmentary networks to demonstrate the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items. Contract time can only be extended by authorized approved change order.
   b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.
   c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.
      1) Asset Management Certificate of Use and Occupancy must be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
      2) The Contractor shall have the number of calendar days stated in the contract, from the date of the first Asset Management Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements

   A. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every submittal shop drawings, product data, samples and other submittal required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   B. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract.

This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

C. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

D. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.

a) Deliveries of Owner-furnished equipment or materials shall be shown on the schedule with time windows to be provided by the Commonwealth.

b) Neither the Architect nor the Commonwealth will not be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

1.05 Critical Path Method Scheduler

A. The Contractor shall provide a full-time, independent, project-dedicated scheduler who shall attend all progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Architect and Asset Management Project Manager for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the Asset Management Project Manager deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical

path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Asset Management inspection staff, job photos, weekly meeting minutes, monthly progress reports, Contractor weekly bar charts or two-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of the Asset Management and the Contractor.
2. Sequestering of float shall be cause for rejection of the Contractor's schedule submittal. In the event that float sequestering is identified the Contractor, through the Project Scheduler, shall have the computer-produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The Contractor, through the Project Scheduler, shall require the Architect, all major subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The Contractor must submit an as-built construction schedule (certified by the Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

1.06 Design of Project

A. The Architect shall prepare a Designer's Work Plan, clearly outlining his/her time projections for schematic design, design development, construction documents, requisite workshops, permitting and construction administration functions, and any other design-related activities that may be determined with the Contractor. Said Designer's Work Plan shall be integrated into the Critical Path Method (CPM) Schedule.

B. Upon completion of the Design Development documents and upon completion of the Working Documents, the same shall be furnished to the Asset Management for review and comment. In each instance, Asset Management shall have fourteen [14] calendar days to review the same after receipt thereof, and to either accept such documents as submitted, or provide written notice to the Contractor that such documents are not in compliance with Asset Management requirements, specifying and detailing such objections.

C. In the event Asset Management shall fail to object to such documents within such fourteen [14] calendar day period, it shall be deemed to have approved such documents. Upon receipt of any such objections, the Contractor shall correct such documents in a timely manner and resubmit the same to Asset Management for approval in the same manner as with regard to the initial documents.

D. In the event the Contractor disputes the Asset Management's comments or directives, the Contractor shall notify Asset Management in writing within seven [7] calendar days after receiving such comments of his/her disagreement with such comments. Notwithstanding continued efforts by the Contractor and Asset Management to resolve such dispute, the Contractor shall proceed with any correction and resubmission requested by Asset Management. All such disputes pending shall be resolved in accordance with provisions of the contract.

E. It is understood and agreed that the Design Development documents are intended to be the basis of the Working Documents with regard to all matters of function, structure and aesthetics; and the Working Documents will differ from the Design Development documents only to the extent they include working drawings and final specifications. In its review and approval of subsequent stages of Design Development documents and Working Documents, Asset Management shall be bound by approvals given with respect to earlier stages.

F. Asset Management and the Contractor agree and understand that the Contractor may commence construction of the project upon receipt of:

1. Asset Management approval of the Working Documents for the portion of the Work to be undertaken, and

2. of all governmental approvals necessary to commence such portion of the Work.

SECTION 01310

CONSTRUCTION PROGRESS SCHEDULE
(Conventional Project Methodology w/ FLCC Greater Than $ 20 MM)

1.01 General Provisions

A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.02 Construction Schedule

A. Contractor shall prepare and submit, for Architect and Asset Management's information, a Critical Path Method (CPM) Progress Schedule for the work of the project. Said schedule will be coordinated to include sequencing of the project work (if sequencing is required). In addition, a Project Scheduler will be required for this project.

1. General Schedule Requirements

2. Critical Path Method (CPM) Schedule Requirements

3. Critical Path Submission Requirements

4. Critical Path Progress Reporting and Changes

5. Progress Payments to Contractor

6. Adjustment of Critical Path Contract Completion Time

B. Critical Path Method Scheduler

1.03 Related Sections

A. CONTRACT AND GENERAL CONDITIONS

1. Failure to Complete the Work on Time --- Liquidated Damages.

B. SECTION 01200 --- PROJECT MEETINGS

1. Project Meetings

C. SECTION 01340 --- SUBMITTALS

1. Progress Reports

2. Schedule of Values

3. Shop Drawings, Product Data and Samples

1.04 Critical Path Method Scheduling

A. Contractor's Schedule Requirements are contained herein, and are to be provided by the Contractor.

1. General Schedule Requirements

a. Upon the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall develop a network plan as defined hereinafter, demonstrating complete fulfillment of all contract requirements. The Contractor shall keep the network plan up to date in accordance with the progress and logic update requirements stated herein, and shall utilize the network plan in planning, coordinating and performing the work of this project (including all construction-related activities of designer subcontractors, equipment vendors and suppliers). Contractor's monthly payments will be made in direct relation to the activity items scheduled and by the progress completion of those activities. The Contractor shall provide the microcomputer, associated hardware and software required for the project site as defined hereinafter under Additional Requirements - Computer Equipment and Software. Substitute software, approved in writing by Asset Management, will be considered provided that the promised substitution is totally compatible with PRIMAVERA and all Asset Management supplied software.

b. Within 30 calendar days of the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit to Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the first 90 calendar days of the project. This preliminary 90-day schedule need not be resource loaded. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.

c. Within 60 calendar days after the finalization of agreement (signified by issuance of Division of Capital Asset Management D19: Notice to Proceed), the Contractor shall submit for review by Asset Management and the Designer, a Time Scaled Critical Path Method (CPM) Network Diagram for the complete project. All completion dates shall be within the period specified for contract completion. This complete duration project schedule must be fully resource loaded. The Contractor shall provide a presentation where the schedule's activities and logic are fully explained.

d. Within 15 calendar days after receipt of the Critical Path Method Network Diagram, Asset Management and the Contractor shall meet with the Designer and their consultant engineers and subcontractors, and the Project Scheduler, for joint review(s), correction, or adjustment of the proposed plan and schedule(s). Within 10 calendar days after the joint review(s), the Contractor shall revise the proposed CPM Network Diagram in accordance with agreements reached during the joint review(s) and shall furnish two copies of the Diagram as defined hereinafter (in Para. 1.04.3), to Asset Management, and one copy to the Designer. This CPM Network Diagram, as revised at the joint review, is the Project Schedule (and shall be the Target Schedule to which all future changes are compared) until subsequently revised in accordance with the logic update requirements stated hereinafter (in Para. 1.04.4). All appropriate trade contractors shall also be furnished copies of the Time Scale Network Diagram.

e. Until the joint review(s) and subsequent issuance of the Project Schedule, as defined here in before, the establishment of the PRIMAVERA database, all Payment Requisition Schedule of Values and Contractor Payment Forms may be produced manually.

2. Critical Path Method (CPM) Scheduling Requirements

a. The Critical Path Method (CPM) schedule shall show the sequence and interdependence of activities required and shall reflect the manner in which actual work will be performed. The number of activities shown on the Critical Path schedule must be at least equal and related to the number of items listed in the Schedule of Values, however the Contractor must submit a detailed explanation that identifies what each activity includes. In preparing the Critical Path schedule, the Contractor shall break up the work into activities not exceeding two calendar months each, except as to non-construction activities (i.e., procurement of materials and delivery of equipment) and any other activities for which Asset Management may approve the showing of longer duration. The schedule shall show not only the activities for actual construction work for each trade category of the project but also activities on which the work is dependent (i.e., such as the submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication, material delivery times,

Designer/Asset Management review and approval of shop drawings, equipment schedules, samples and templates, and the delivery of Owner furnished equipment). In addition, the complete duration project schedule submission that is to be made 60 calendar days after the finalization of agreement (signified by issuance of Division of Asset Management D19: Notice to Proceed) shall be resource loaded with costs, manpower (labor by craft or trade), and equipment for all on-site construction activities shown on the schedule. All activities shall be logically tied to one common end date. The number of construction activities shown on the Critical Path schedule shall be capable of being summarized to a level equivalent to the individual specification sections, for which any item of work is being performed (defined hereinafter in Para. 1.04.2.b). To the extent that the Critical Path schedule shows anything not jointly agreed upon, or fails to show anything jointly agreed upon, it shall not be deemed to have been accepted by Asset Management. Failure to include any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding Asset Management acceptance of the Critical Path schedule.

b. The baseline data to be entered for each individual activity shall include the duration, activity type, activity codes, work breakdown structure, date constraints, cost, resources, custom data items, predecessor activity and successor activity.
   1) Critical Path Method (CPM) Scheduling shall be carried as a specific pay item on the Schedule of Values.
   2) Each activity shall be assigned a Work Breakdown Structure (WBS) Code. The WBS is to be structured in levels of deliverable work elements beginning with the end result (Level 1), and then divided into identifiable deliverable work elements (Level 2, 3, 4, etc.). The Asset Management Project Manager, Designer and Contractor will meet to establish a WBS specific to the project.
   3) Each activity shall be assigned Activity Codes. The Activity Codes shall identify specific groups such as responsibility, phase, system, location, CSI Division, specification section and corresponding Schedule of Values ID. This is not a complete list. The Asset Management Project Manager, Designer and Contractor will meet to establish Activity Codes specific to the project.

3. Critical Path Submission Requirements (CPM Network Diagram elements)
   a. As a minimum, the Contractor shall furnish, monthly with each Critical Path Submission, and each revision thereof required in the logic update, three (3) copies of the following PRIMAVERA output reports (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Current Schedule Comparison to Target Schedule
      2) Network Logic: Detailed Precedence Analysis
      3) Activity Input Listing sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Schedule Sort by Early Start and Total Float
      5) Actual Cash, Manpower and Equipment Flows (on schedule - Monthly; late schedule - Weekly)
   b. As a minimum, the following computer-produced PRIMAVERA graphic reports shall be supplied with each Critical Path Submission and revision thereto (which shall show Early Start, Early Finish, Late Start, Late Finish and Total Float):
      1) Gantt Chart sorted by early start date and WBS or Activity Codes, per Asset Management Project Manager
      2) Bar Chart - Two Week Look Ahead sorted by WBS or Activity Codes, per Asset Management Project Manager (and narrative format if requested by the Asset Management Project Manager, at no additional cost)
      3) Time Scaled Network Diagram (PERTVIEW) sorted by WBS or Activity Codes, per Asset Management Project Manager
      4) Cash, Manpower and Equipment Flows (monthly and cumulative)

c. Payment requisition Schedule of Values (CSI formatted) and Contractor Payment form, to be produced monthly through custom software which uses the PRIMAVERA database percentage complete to calculate payment owed to Contractor.
d. PRIMAVERA Database: The complete PRIMAVERA database for the project shall be submitted monthly with each Critical Path Submission on a floppy disk or as otherwise requested by Asset Management.
e. Material/Supplies Schedule: As a minimum, a full list of all materials required for the project shall be listed. This list shall include coded sub-lists (per Para. 1.04.7) relating to the activity codes of the Critical Path Method schedule. The Material/Supplies Schedule sub-lists shall be required which list all materials required for critical activities, all items of long lead time nature (i.e., transformers, plantings, windows, doors and frames, electrical and mechanical equipment, etc.), all pre-purchase items and all Owner-furnished items. The schedule shall provide names, addresses, telephone numbers of suppliers, key suppliers' contact person, order placement data, order confirmation data, proposed arrival date, actual arrival date and all other pertinent information. This Critical Materials/Supplies Schedule and its associated sub-lists shall be updated as directed by Asset Management and as a minimum at each Logic Update period.
f. Utilities Schedule: As a minimum, a full list of all utilities required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of utility, usage levels required, and timing of requirements.
g. Equipment Schedule: As a minimum, a full list of all equipment required for the project shall be listed. The list shall include codes that relate to the activity code of the Critical Path schedule where appropriate. The list shall include type of equipment, usage levels required, and timing of requirements.
h. The Contractor shall manually update the latest computer generated Gantt Chart and Time Scaled Network Diagram for review at each project job meeting.
i. A two-week look ahead schedule, generated from the Project Schedule, shall be submitted for review and discussion at the weekly project meeting.

4. Critical Path Progress Reporting and Changes (Progress and Logic Update)
   a. The Contractor shall provide a complete progress and logic update monthly. The progress and logic update shall include complete updating of the schedule progress per activity --- both amount paid and amount remaining. Actual cost amount paid and amount remaining shall agree with the payment requisition forms required hereinbefore (in sub-paragraph 1.04.3.c.). The requirements for schedule progress reporting are further specified hereinafter. A full Critical Path Submission will be required at each progress and logic update.
   b. In addition to the progress and logic update requirements, the Contractor shall prepare and submit to Asset Management a revised Critical Path Submission showing all changes in network logic, including but not limited to changes in activity duration, and revised activity costs as a result of contract changes in activity sequence and any changes in contract completion dates which have been made pursuant to the provisions of the contract for adjustment of contract completion time, since the last revision of the critical path schedule. The contract completion date or dates shall be adjusted to reflect time extensions granted on the activities in accordance with the contract. The contract completion date or dates shall remain constant when data in regards to actual progress (activity start, activity completion, percent completed, etc.) are entered and delay shows a negative float/slack. Where Asset Management has not yet made a final determination, as to the amount of time extension to be granted and the parties are unable to agree as to the amount of the extension to be reflected in the critical path schedule, the Contractor shall reflect that amount of time extension in the critical path schedule as Asset Management may determine in their best judgment, to be appropriate for such interim purpose. It is understood and agreed that any such interim determination by Asset Management for the purposes of this paragraph shall not be binding upon either party for any other purpose and that, after Asset Management has made final

determination as to any time extension, the Contractor will revise the critical path schedule prepared thereafter in accordance with the final decision, in accordance with the contract.

c. Prior to the date specified by Asset Management for submission of the logic update (i.e., at each Contractor pencil monthly payment requisition, one week prior to the approval of the Contractor monthly payment requisition), the Project Scheduler, including input from Contractor, subcontractors, trade contractors and the Architect, shall update the computer-produced schedule and diagrams. The update shall show actual progress and percent completed of activities in progress, identify those activities started and those completed during the previous logic update period, show the estimated time required to complete each activity started but not yet completed, and reflect any changes in the critical path schedule approved in accordance with the Critical Path Scheduling Requirements and Progress and Logic Update paragraphs of this Section (Para. 1.04.2 and 1.04.4). Actual progress to-date shall be entered by inputting actual start date and remaining duration (or early finish) for each activity which has either started during the monthly update period or is ongoing. In addition to entering remaining duration, the percent complete shall be entered for that activity. However, percent complete calculation shall be set to manual using the project default screen. After completion of the review and Asset Management approval of all entries, the Contractor shall submit an updated Critical Path Submission, in the detail specified in the Critical Path Submission Requirements of this Section (Para. 1.04.3), to Asset Management, no later than the close of business on the date specified by Asset Management for submission of edited Contractor monthly payment requisition (normally one week after pencil monthly payment requisition review).

d. The Contractor shall assume that the full duration of the contract will be required to complete the work of the contract. Positive float/slack belongs to the project and must be used in the best interest of completing the project on time in the event departure from the network occurs. If negative float/slack is indicated on the schedule, recovery schedules shall be prepared by the Contractor at no additional cost to the Commonwealth, indicating how the work will be expedited to meet current contract completion dates. The Contractor's construction schedule shall begin with the date of issuance of the Notice to Proceed and conclude with the contract date of Final Completion of the Project. Float or slack time within the construction schedule is not for the exclusive use or benefit of either the Commonwealth or the General Contractor, but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the contract completion date. Therefore, any existing float shall be used to the maximum extent possible to offset:
   1) Unexpected delays which occur in connection with the Building Contractor's work; and
   2) Contract change actions initiated by the parties specified in the contract (i.e., Changes in the Work).

e. Where delays are incurred, the Contractor shall provide through weekly and/or full logic CPM update how the work delay can be returned to the approved schedule. The Contractor agrees that whenever it becomes apparent from the current weekly computer produced calendar-dated schedule that the contract completion date will not be met, he/she will take some or all of the following actions at no additional cost to the Commonwealth:
   1) Increase construction manpower and/or equipment in such quantities and crafts as will substantially eliminate, in the judgment of the Asset Management, the backlog of work.
   2) Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate, in the judgment of Asset Management, the backlog of work.
   3) Reschedule activities to achieve maximum practical concurrence of accomplishment of activities.

f. Float shall be used as it occurs (time extension granted or job delay). If a time extension and job delay occurs in the same logic update period (normally weekly), the delay will be entered in the network first.

g. In addition to the foregoing, the Contractor shall submit a narrative report every other week (bi- weekly) and at the same time as the updated schedule required by the preceding

paragraphs in a form agreed upon by Asset Management. The narrative report shall include a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.

h. Asset Management shall have the right to require the Contractor to furnish additional printouts of logic updated schedules and time scaled network diagrams, reflecting actual or estimated time changes resulting from unexpected delays, change orders, strikes, etc., at no additional cost to the Commonwealth.

5. Progress Payments to Contractor
   a. The monthly Critical Path Submission shall be an integral part and basic element of the estimate upon which progress payments shall be made. The Contractor shall be entitled to progress payment only upon approval of estimates as determined from the currently approved updated computer-produced Critical Path schedule. Payments will be made against activity items shown on the computer-produced schedule and as reflected on Asset Management approved format payment forms which shall be used in conjunction with PRIMAVERA. The Contractor shall produce the Schedule of Values and the Standard Payment forms by following the guidelines of Asset Management staff. This shall include entering the Net Amount Paid to subcontractors against the appropriate activities.
   b. Whereas every schedule activity is cost loaded, as well as manpower and equipment loaded, (i.e., the schedule of payment values lists all schedule activities, at the end of every month the Contractor's payment application is a listing of all schedule activities started and completed, the percentage of work accomplished, and a calculation of the value of the work performed), but the Commonwealth is required to pay for work performed within a mandated time frame, the submittal of the schedule update is not a "condition precedent" to monthly progress payments; however, in the event the Contractor fails to submit a computer-produced calendar-dated schedule or the initial or revised time scaled network diagram on the date designated by Asset Management, Asset Management shall have the right, after giving written notice to the Contractor, to have the computer-produced calendar-dated schedule or time scaled network diagram prepared or revised (as applicable) by separate computer contract award or otherwise and to deduct the cost thereof from the contract amount through the progress payment which becomes due upon completion thereof and upon approval of Asset Management of the payment request. If, however, the Contractor fails or refuses to furnish the information and data which, in the judgment of the Asset Management Project Manager, are necessary for preparation or revision of the computer-produced calendar-dated schedule or time scaled network diagram by separate contract or otherwise, after seven [7]calendar days written notice, the schedule requirement terms of the contract may be considered to have been breached by the Contractor, and Asset Management may take any or all of the following additional actions:
      1) Impose lack-of-schedule damages (separate and distinct from liquidated damages), at a cost of $ 300 per day for every day the schedule submittal is late.
      2) Terminate the contract with prejudice (per Article VIII of the contract).

6. Adjustment of Critical Path Contract Completion Time
   a. The contract completion time or contract cost will and in general be adjusted only for change orders approved by Asset Management as outlined in the contract. In the event the Contractor requests an extension of any contract completion date or cost increase he/she shall furnish such justification and supporting evidence as Asset Management may deem necessary for the determinations to whether the Contractor is entitled to an extension of time or contract cost adjustment under the provisions of this contract. Asset Management approval as to the total number of days extension and/or increase in contract value shall be based upon the currently accepted computer-produced Critical Path schedule and on all data relevant to the extension. A request for an extension of time, associated with the change orders will not be considered unless it is clearly proven that the critical path has been negatively effected (such as, but not limited to, time impact analysis using resource loaded fragmentary networks to demonstrate

the effect of delays on the overall project schedule). Such data shall be included as an activity linked to the activity which is being impacted and will appear in the next monthly schedule and logic update. All extensions for related manpower/equipment increases shall be applied to the appropriate existing activity items. Contract time can only be extended by authorized approved change order.

b. Whereas time is of the essence in the performance of work under the contract, each request for change in any contract completion date shall be submitted by the Contractor to Asset Management at the time an alleged delay occurs. Failure to notify Asset Management of any delay as provided in the contract shall preclude the Contractor from subsequently claiming any damages due to said delay.

c. For purposes of scheduling, the project will be considered to be Substantially Complete when all work affecting health, safety and function is totally completed, and with less than one [1] percent of the base contract value remaining, and ready for complete Use and Occupancy as determined by the Asset Management Project Manager, the Operating Agencies (individually or collectively), and the Architect. Then the User Agencies (individually or collectively) will take control of their building area(s) and be responsible for operating costs and security. Final punch lists will be established and monetized at this time.
   1) The Asset Management Certificate of Use and Occupancy may be issued for partial Use and Occupancy, contingent upon conditions set forth by the Building Official having jurisdiction. The Massachusetts Department of Public Safety Occupancy Certificate must be issued by the effective Substantial Completion date.
   2) The Contractor shall have the number of calendar days stated in the contract, from the date of Notice to Proceed, to complete all the work before Substantial Completion is achieved. If the Contractor fails to complete the work within the contract completion time frame so stated, the Contractor shall be subject to the assessment of liquidated damages.

7. Additional Requirements

   A. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every submittal shop drawings, product data, samples and other submittal required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   B. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every long lead item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.
   C. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every pre-purchase item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Shop Drawing Number, Submittal Review and Approval, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date.

D. A list in EXCEL format and the associated database file, as prescribed by Asset Management, of every Owner-furnished item required by the contract, General Conditions, Supplementary Conditions and/or technical specifications of the construction contract. This required list shall be set upon a template, based on the Contractor's Work Breakdown Structure (WBS) to facilitate reporting, showing the following: Specification Section, Sub-Section Number, Item Number, Description, Actual Order Date, Procurement and Fabrication, Schedule Delivery Date, Date Received, Scheduled Installation Date and Actual Installation Date. The list of Owner-furnished items shall correspond with the construction schedule so that the submissions relate to the time when the products and/or systems will actually be required on the site.
   a) Deliveries of Owner-furnished equipment or materials shall be shown on the with time windows to be provided by the Commonwealth.
   b) Neither the Architect nor the Commonwealth will be responsible for acceptance of a list that calls for out-of-sequence delivery of Owner-furnished items.

1.05 Critical Path Method Scheduler

A. The Contractor shall provide a full-time, independent, project-dedicated scheduler who shall attend progress and logic update meetings to address project progress, alleged delays and cost or time impacts. The name of the Project Scheduler, together with his qualifications, shall be submitted to the Architect and Asset Management Project Manager for mutual approval. The Project Scheduler shall have a minimum of five [5] years of project CPM scheduling experience, three [3] years of which shall be on projects of similar scope and value to this project. References shall be provided from past projects that can attest to the capabilities of the Project Scheduler. A Project Scheduler who the Asset Management Project Manager deems unqualified, or who engages in "schedule gamesmanship" rather than consciously and accurately portraying progress of the work, will be replaced at no additional cost to the Commonwealth.

B. The General Conditions and General Requirements of the construction contract apply to the Contractor with regards to responsibility for the scheduling of all trades. The Project Scheduler shall ensure the total and complete scheduling of all work of the project as such work relates to the Contractor's work and all other sub-trades.

C. The purpose of the Project Scheduler shall be to accurately portray all relevant activities required to complete the work according to the contract documents, organized in a logical sequence and, generally, time scaled.

D. Preferential sequencing (i.e., whereby activities that could be performed concurrently and are established in the project schedule as sequential simply to consume float), and/or indicating artificial activity durations (i.e., inflating activities in the schedule to consume float and influence the critical path) are unacceptable. The Project Scheduler will provide monthly comparisons of the start and finish dates with field records of Asset Management inspection staff, job photos, weekly meeting minutes, monthly progress reports, Contractor weekly bar charts or three-week look ahead schedules, and accurately update the schedule to reflect actual job progress.

1. Pursuant to the float-sharing requirements of the contract documents, the use of float suppression techniques (a.k.a., sequestering float) such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and the use of float time disclosed or implied by the use of alternate float suppression techniques shall be shared to the proportionate benefit of Asset Management and the Contractor.

2. Sequestering of float shall be cause for rejection of the Contractor's schedule submittal. In the event that float sequestering is identified the Contractor, through the Project Scheduler, shall have the computer -produced calendar-dated schedule or time scaled network diagram revised appropriately, at no additional cost to the Commonwealth.

E. The Contractor, through the Project Scheduler, shall require all major subcontractors (including, but not limited to, Site Work, Masonry, Structural Steel, Fireproofing, Roofing, Elevators, Mechanical, Plumbing, Electrical, and all other subcontractors with a subcontract equal to or in excess of five [5] percent of the contract value) to participate in and sign off on the baseline schedule and all schedule updates. The Contractor must submit an as-built construction schedule (certified by the Contractor's Project Manager and the Project Scheduler as representing the way the project was actually constructed) as a condition precedent to Final Acceptance.

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